

Effectiveness of a brief lifestyle intervention targeting mental health staff: analysis of physical fitness and activity in the Keeping Our Staff in Mind study

Hamish Fibbins ^{1,2} Philip B Ward,^{1,3} Jackie Curtis,^{1,2} Andrew Watkins,^{2,4} Oscar Lederman,^{2,5} Rachel Morell,¹ Simon Rosenbaum^{1,6}

To cite: Fibbins H, Ward PB, Curtis J, *et al.* Effectiveness of a brief lifestyle intervention targeting mental health staff: analysis of physical fitness and activity in the Keeping Our Staff in Mind study. *BMJ Open Sport & Exercise Medicine* 2020;**6**:e000761. doi:10.1136/bmjsem-2020-000761

Accepted 17 June 2020



© Author(s) (or their employer(s)) 2020. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

¹School of Psychiatry, University of New South Wales, Sydney, New South Wales, Australia

²Keeping the Body in Mind Program, South Eastern Sydney Local Health District, Sydney, New South Wales, Australia

³Schizophrenia Research Unit, Liverpool Hospital and Ingham Institute of Applied Medical Research, Sydney, New South Wales, Australia

⁴Faculty of Health, University of Technology Sydney, Sydney, New South Wales, Australia

⁵School of Medical Science, University of New South Wales, Sydney, New South Wales, Australia

⁶Black Dog Institute, Randwick, New South Wales, Australia

Correspondence to

Hamish Fibbins;
hamish.fibbins@health.nsw.gov.au

ABSTRACT

Background People with mental illness die on average 15 years less than the general population, primarily to cardiometabolic disease. Lifestyle interventions are effective in reducing cardiometabolic risk but are not routinely provided to mental health consumers. Lifestyle interventions targeting mental health staff may be beneficial in changing culture surrounding physical health and subsequently improving consumer outcomes. This study examines exercise and fitness outcomes of a targeted lifestyle intervention directed at Australian mental health staff.

Methods A pragmatic single-arm intervention study was conducted within an Australian public mental health service. Mental health staff were provided a five-session individualised lifestyle intervention (incorporating exercise and nutritional counselling) over 5 weeks. Two waves of the programme were delivered between 2015 and 2016. This paper examines the exercise and fitness outcomes of the second wave of the study. Participants were assessed at baseline and at a 16-week follow-up. The primary exercise outcome was a measurement of cardiorespiratory fitness. Secondary outcomes included self-reported physical activity and a measurement of handgrip strength.

Results A total of 106 staff participated in this component of the study. Cardiorespiratory fitness increased significantly from baseline to follow-up ($p<0.001$). Significant improvements to physical activity occurred with decreases in sedentary time ($p<0.0005$) and increases in moderate-to-vigorous physical activity ($p<0.005$).

Conclusion Lifestyle interventions incorporating exercise counselling may improve the physical health of mental health staff. Such strategies may be effective in improving culture surrounding physical health and/or increasing the effectiveness of lifestyle interventions targeting mental health consumers.

INTRODUCTION

The high rates of premature mortality in people with severe mental illness (SMI) are well recognised.¹ Despite this, people with

What are the main findings?

- ▶ Lifestyle interventions targeting mental health staff with a focus on real-world conditions are feasible and acceptable.
- ▶ These interventions may improve the physical health of staff.
- ▶ Novel strategies, such as exercise interventions, may be effective in instigating culture change regarding physical health in mental health settings

SMI continue to face a life expectancy up to 15 years less than the general population.^{2–4} This is largely attributed to poor cardiometabolic health among the SMI population^{5 6} linked to metabolic abnormalities in part induced by antipsychotic medication,^{6 7} in addition to adverse modifiable lifestyle habits including poor nutrition,⁸ low levels of physical activity⁹ and high rates of tobacco smoking.¹⁰

A growing evidence base has highlighted the positive effects of exercise interventions in reducing the cardiometabolic risks for people with SMI.^{8 11} Additionally, improvements in symptomatology, cognition and psychosocial functioning of people with SMI occur in response to increased exercise.^{12 13}

The efficacy of these interventions on physical and mental well-being for people with SMI are clear; however, with ‘so many publications and so little change’, there is a need for new strategies to facilitate translation of research findings into practice.¹⁴ In addition to randomised control trials, evaluating innovative health interventions that enhance usual care in actual hospital and community settings is important for external versus internal validity.¹⁵ Implementation studies with a focus on real-world conditions can be an effective way of informing translation

research^{16 17} and enhance adoption and delivery of services by healthcare systems.¹⁸

Strengthening delivery of physical health services within the mental health system is critical to improved well-being for people with SMI.¹⁹ People with SMI are more likely to participate in physical health activities when they have access to positive supportive networks,^{20 21} and mental health professionals can be role models as they are more likely to encourage their clients towards healthy behaviours if they themselves partake in such activities.²² However, significant barriers exist for mental health staff to promote physical activity, particularly in acute mental health settings.²³ Negative staff attitudes towards physical health programmes, competing work demands and lack of management support can make staff engagement difficult.^{24 25} Building mental health staff knowledge, confidence and attitudes towards lifestyle interventions may play a key role in their real-world implementation.

A recent systematic review of staff-focused lifestyle interventions suggested feasibility and acceptability of exercise programmes targeting mental health staff; however, the small number of high-quality studies highlighted the need for more real-world implementation programmes.²⁶

We aimed to determine the effectiveness of Keeping our Staff in Mind (KoSiM), a brief lifestyle intervention targeting mental health staff working in a public mental health services. KoSiM provided an opportunity for mental health staff to learn about the physical health team 'Keeping the Body in Mind' that was being implemented across the South Eastern Sydney Local Health District (SESLHD). An overall description of the KoSiM intervention and outcomes has been published.²⁷ This report focuses on the impact on exercise and fitness outcomes for wave 2 of KoSiM. Only fitness data from wave 2 were analysed due to limited data collection of fitness measures during wave 1.

METHODS

Study design

A multisite, open trial was conducted. The brief KoSiM lifestyle intervention was delivered across SESLHD, a public health service that employs approximately 700 mental health staff that provide inpatient and community-based mental health services primarily to people with SMI. KoSiM offered specialised lifestyle interventions to all mental health staff working in the SESLHD. This novel programme was rolled out in two waves during 2015 and 2016.

Participants

Recruitment to KoSiM was initiated through surveys email to all staff members via workplace email, both clinical and non-clinical, currently employed in the mental health department of SESLHD working at hospital sites including Prince of Wales Hospital Randwick, The Sutherland Hospital Sutherland and St George Hospital Kogarah. The survey examined the physical health of

staff along with their knowledge and confidence in providing physical health interventions for clients. Staff were also asked about their previous engagement with physical health specialists such as dietitians and exercise physiologists. Staff were then provided with information to self-refer to the KoSiM intervention. No restriction was placed on the field of employment with nurses, doctors, allied health, administration staff, researchers and executive staff all invited to participate. Initial and follow-up appointments took place at all three hospital locations during working hours. Staff received support from executive management to attend appointments during work hours.

Intervention

An initial consultation with a clinical nurse consultant, accredited exercise physiologist and accredited practising dietitian allowed participants to set health goals, anthropometric measurements, fitness testing and dietary analysis. Participants were then offered four consultations with either the accredited exercise physiologist or accredited practising dietitian, depending on their preference and identified goals determined during the initial consultation. The clinical nurse consultant conducted a review at week 5, which provided an opportunity to reassess anthropometry, review health goals and enrol in 'Get Healthy', a free telephone health coaching service. At week 16, participants met for a final review with the clinical nurse consultant, accredited exercise physiologist and accredited practising dietitian to measure follow-up anthropometry, perform fitness testing and review any changes to their physical health and well-being.

Additional services were also provided throughout the intervention as ongoing support and motivation for the participants to continue with their physical health goals. Seven newsletters were emailed to participants that included information and education on physical health topics. A healthy group lunch was provided at each hospital site to facilitate group discussion and engagement in the programme.

Exercise intervention

As previously noted, overall outcomes of the KoSiM intervention have been previously reported,²⁷ and this report focuses on the exercise component of the intervention.

The initial consultation with the accredited exercise physiologist lasted approximately 30 min and provided an opportunity to establish rapport and obtain a detailed physical activity history. Motivational interviewing, goal setting and identification of potential barriers to engaging in physical activity were key elements. Specific, measurable, achievable, and relevant and time specific (SMART) principles were employed to ensure goals met participants' needs. During this initial consultation current self-reported physical activity levels were recorded, and baseline physical fitness tests were performed. The Physical Activity Readiness Questionnaire²⁸ was completed to identify any exercise contraindications. Results of

fitness tests and self-reported physical activity levels were interpreted for participants, including comparison to normative values.

Follow-up consultations with the accredited exercise physiologist were used to review physical activity goals and continue motivational interviewing to encourage newly adopted exercise habits. Participants could also use the session to exercise with the accredited exercise physiologist. Limited equipment was available for these workouts, with participants usually engaging in body weight resistance training or high intensity interval training on a stationary bicycle. Time was also spent providing education on relevant physical activity topics including exercise and weight loss, strength training and metabolic pathology.

The final assessment at 16 weeks included a review of goals and follow-up fitness testing. A comparison of the initial and follow-up data provided an opportunity to review progress made and a final chance to use motivational interviewing before concluding the intervention. Follow-up outcome measures were performed at 16 weeks rather than at conclusion of the programme at 5 weeks as fitness changes were more likely to be detected with longer follow-up.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

OUTCOME MEASURE

Primary outcome: cardiorespiratory fitness

This was assessed via the Astrand Rhyming submaximal test.^{29 30} The test involves 6 min of cycling on a cycle ergometer (Monark 828E Ergomedic bike) at a specified resistance while measuring heart rate response. The average heart rate of the final 2 min of exercise is recorded and used via the Astrand-Rhyming gender-sensitive nomogram to estimate the participants' VO_2max , or maximum rate of oxygen consumption, an indicator of cardiorespiratory fitness. Results were then normalised to age.

Secondary outcomes

Self-reported physical activity

Self-reported physical activity was assessed using the short-form International Physical Activity Questionnaire (IPAQ),³¹ comprising four questions about levels of physical activity. Questions refer to activity performed over the previous 7 days and include 10 min or more of vigorous activity, moderate activity and minutes of walking, in addition to hours of sedentary time.

Handgrip strength

Handgrip strength was recorded using a TTM Original handgrip strength dynamometer (Model number 16535) following a standard protocol.³² Participants stood with arm flexed at 90° and instructed to squeeze as hard as

possible holding for 3 s. Three trials are performed on both hands with 30 s rest between attempts. The highest score for each hand is combined to give the overall score. Handgrip strength correlates with functional capacity, cardiovascular disease risk and cognition.^{33 34}

STATISTICAL ANALYSIS

Data analysis was conducted using the Statistical Package for the Social Science (SPSS), VV.23.0. Data from participants who completed follow-up testing were analysed. Outcome measures were assessed using paired sample t-tests for continuous variables and χ^2 for categorical variables. Bonferroni correction was applied to the five measures analysed by paired sample t-tests (0.05/5), and results were considered significant if $p \leq 0.01$. The proportion meeting Australian guidelines for moderate to vigorous physical activity (MVPA) was an alternative means of evaluating MVPA and was therefore not subject to Bonferroni correction. Effect sizes for mean change scores were calculated using partial η^2 squared (η_p^2). Effect sizes were deemed small (0.10), medium (0.3) or large (0.5).³⁵ Relationship between variables were examined using Spearman's rho correlation coefficients. Comparison of the baseline data from those who dropped out compared with those who completed the intervention were evaluated using independent samples t-tests.

RESULTS

In total, $n=106$ staff members participated in wave 2 of the KoSiM study. Participants were predominately female ($n=85$, 80%), from an allied health background (eg, social work, occupational therapy and psychology) ($n=41$, 39%) or a nursing background ($n=33$, 31%) and most worked in community settings ($n=64$, 61%). Demographic data are summarised in [table 1](#). Seventy-seven of the participants (73%) requested follow-up appointments (not including the initial or final assessments) with the accredited exercise physiologist and the mean number of sessions attended was 2 (median=1.0, range=0–5). Prior to starting the programme, only 10% of participants had seen an accredited exercise physiologist for their own physical health or worked with one in a professional capacity. Regarding participant drop-out, 30 participants (28.3%) did not complete the follow-up physical activity questionnaire, and 45 did not complete the follow-up fitness testing (42.5%).

In total, 61 (57.5%) participants completed follow-up cardiorespiratory fitness testing at 16 weeks with a mean increase in estimated VO_2max of 2.8 mL/kg/min (95% CI 1.4 to 4.1), which represented statistically significant improvements ($t=4.1$, $p<0.001$), with a small effect size ($\eta_p^2=0.2$). VO_2max changes of this magnitude are associated with clinically meaningful improvements in cardiovascular mortality.³⁶

We found significant improvements in self-reported physical activity levels among the 76 (71.7%) participants who completed the follow-up physical activity questionnaire. Sedentary behaviour decreased significantly by

Table 1 Characteristics of participants (n=106)

Characteristic	Participants (n (%))
Age (years)	
18–24	6 (6)
25–34	29 (27)
35–44	24 (23)
45–54	25 (24)
55+	22 (20)
Sex	
Female	85 (80)
Male	21 (20)
Location	
Prince of Wales Randwick	65 (61)
St George	23 (22)
Sutherland	18 (17)
Role	
Nurse	33 (31)
Allied health	41 (39)
Medical	8 (7)
Non-clinical	24 (23)
Service setting	
Inpatient acute	15 (14)
Inpatient non-acute	20 (19)
Community	64 (61)
Administration	7 (6)

an average of 110.3 min per day (95% CI –148.9 to 71.6; $t=-5.7$, $p<0.0005$), representing a medium effect size ($n^2_p=0.3$). A mean of MVPA increased significantly (45.0 min per week; 95% CI 14.3 to 75.7; $t=2.9$, $p=0.005$), which represented a small effect size ($n^2_p=0.1$). The number of participants that met the Australian recommended guidelines of 150 min or more of MVPA per week increased significantly from $n=24$ (32% of completers) to $n=33$

(44% of completers) ($\chi^2=11.88$, $p=0.01$). There was a non-significant increase of time spent walking each week (76.5 min; 95% CI 14.5 to 138.4; $t=2.5$, $p=0.02$).

No statistically significant or clinically meaningful changes occurred for handgrip strength in the participants who completed follow-up testing (95% CI 0.01 to 4.0; $t=2.0$, $p=0.05$).

A statistically significant correlation was found between the change in VO_{2max} and time spent walking ($r=0.27$, $p=0.04$). Drop-outs or non-completers had lower aerobic fitness levels ($t=-2.8$, $p<0.05$) and engaged in fewer minutes of MVPA per week ($t=-2.4$, $p<0.05$) than those who completed the intervention. Data related to outcomes measures are presented in [table 2](#).

DISCUSSION

This novel, staff-focused exercise intervention, conducted under real-world conditions was feasible and acceptable for mental health staff of a large, urban mental health service. Results indicate that the intervention may have been effective in improving participant cardiorespiratory fitness levels, increasing time spent engaging in MVPA and decreasing sedentary time among mental health staff; however, whether the intervention caused these outcomes cannot be assumed in the absence of an adequate control condition. Staff-focused interventions have limited supporting evidence yet high face validity, and the present findings are among the first to examine the effectiveness of exercise interventions targeting mental health staff.

Lifestyle interventions are increasingly recognised as fundamental to improving the physical health of people with SMI. Health professionals engaged in physical activity are more likely to promote it to their clients,²² and the same pattern may also hold true for mental health professionals. Hence, improvements in staff physical health may also have a positive effect on the physical health outcomes of their clients living with mental illness. Translating positive results from trials showing that lifestyle interventions are effective will require novel strategies

Table 2 Mean change of participants from baseline to follow-up

	Mean at baseline	SD	Mean at post	SD	Mean change	95% CI	Paired-sample t-test	Effect size
VO_2 (mL/kg/min) (n=61)	32.3	9.6	35.1	11.3	2.8	1.4 to 4.1	$t=4.1$, $p<0.0005^*$	$n^2_p=0.2$
Handgrip (kg) (n=61)	60.6	15.4	62.6	16.1	2.0	0.01 to 4.0	$t=2.0$, $p=0.049$	$n^2_p=0.1$
MVPA (min/week) (n=76)	105.2	133.8	150.2	152.3	45.0	14.3 to 75.7	$t=2.9$, $p=0.005^*$	$n^2_p=0.1$
Walking (min/week) (n=76)	238.5	313.9	314.9	290.8	76.5	14.5 to 138.4	$t=2.5$, $p=0.02$	$n^2_p=0.1$
Sedentary time (min/day) (n=76)	525.3	161.9	415.0	136.0	-110.3	-148.9, to 71.6	$t=-5.7$, $p<0.0005^*$	$n^2_p=0.3$

*Statistically significant after applying Bonferroni's correction.
MVPA, moderate to vigorous physical activity.

aimed at upskilling the existing workforce in addition to changing the culture of mental health services regarding physical health.

Given the low percentage of mental health staff that had worked with an accredited exercise physiologist prior to the intervention, the increase in exposure, along with increased education and awareness of the accredited exercise physiologist role, suggests that similar interventions could assist culture change in mental health services. Experiencing first-hand the clinical services provided by exercise professionals should assist their integration into multidisciplinary mental health teams.

Following a brief intervention, we found statistically significant and clinically relevant improvements in staff participants' physical activity levels and cardiorespiratory fitness. Given the established link between increased cardiorespiratory fitness and decreased cardiovascular disease risk^{37 38} such an increase in cardiorespiratory fitness represented meaningful improvement in staff physical health and mortality risk.³⁹

Prior to commencing the KoSiM programme, 68% of participants did not meet the Australian recommended guidelines for physical activity, which is comparable with results from a cross-sectional study of mental health clinicians.⁴⁰ At follow-up, this figure had decreased to 56%, which is similar to the levels of the general Australian population.⁴¹ Significant improvements in participants' physical activity levels indicate clinically relevant results from a cardiometabolic health perspective. Mean MVPA levels increased from 105 minutes to 150 minutes per week, which represents clinically significant improvements. Likewise, the significant reduction in daily sedentary time combined with the increase in time spent walking demonstrated effectiveness in promoting increased incidental activity reduced sedentary behaviour. Combined with the improvements in fitness, the KoSiM exercise programme may have reduced cardiometabolic health risks of mental health staff.

A medium-strength correlation was found between the number of hours spent walking and increased VO_2max that highlighted the potential impact of exercise interventions incorporating walking. Direction to increase time spent walking generally does not require exercise-specialist input, providing the opportunity for future studies to provide advice regarding this health behaviour to those who do not have access to exercise specialists. Increasing the ability of non-specialised practitioners to contribute to exercise interventions by providing non-specific general physical activity advice is an important step towards having every health professional playing a role in increasing physical activity in hospital patients.^{42 43} Given the reduction in CVD risk factors that also occur with increased cardiorespiratory fitness in people with mental illness,^{44–46} exercise interventions that target both staff and their patients may offer a unique approach to improving the health of both groups.

Prior to beginning the KoSiM programme, 90% of participants that completed the initial survey had

never been referred to or worked professionally with an accredited exercise physiologist. Previous studies have highlighted barriers for mental health staff when trying to engage clients in physical activity programmes and that staff generally have limited knowledge of referral and treatment pathways for patients to engage with exercise programmes.²³ Given the important role that accredited exercise physiologists have in designing and implementing physical activity programmes within mental healthcare settings,⁴⁷ this highlights a potential educational opportunity for staff participants.

A recent international consensus statement⁴⁸ released by peak exercise physiology and exercise science bodies in Australia, USA, UK and New Zealand highlighted the key factors needing to be addressed to increase access by people with mental illness to exercise programmes in order to improve the life expectancy gap. Staff wellness programmes lead by exercise practitioners were identified as a way of improving culture change surrounding physical health through positive role modelling to mental health clients. The KoSiM exercise programme represented a novel method of intervention to facilitate improvements in physical health and to promote culture change in mental health staff.

Limitations

Results should be interpreted considering several methodological limitations. First, we did not include a control group. Given the novel nature of the intervention, having a control group of staff not engaging in health-promoting activities may have negatively impacted recruitment and retention. As this study was conducted in a busy mental health service, during business hours, and dependent on ongoing management support, randomising potential staff participants to a non-intervention control group was not possible. Given the results of this study, future pragmatic randomised controlled trials are warranted.

Second, sampling bias may have impacted which staff members chose to participate and self-refer to the KoSiM intervention that may have had a positive effect on outcomes. Third, there were a high number of participants who were unable to complete follow-up fitness testing (42.5%). This was partly due to staff being able to opt out of the fitness component and only complete the physical activity questionnaires at follow-up. Given that assessments were conducted during working hours, dropouts also occurred due to staff forgetting to bring exercise clothing or wanting to avoid exercise testing before returning to work. Management approval to conduct this study was contingent on staff flexibility surrounding working arrangements, and as such were largely unavoidable. Future studies investigating the impact of staff focused interventions should focus on determining whether improvements in health outcomes can be obtained through brief interventions conducted during work hours.

Finally, the self-report nature of the IPAQ questionnaire may have impacted reliability of data collected.

Future directions

Mental health staff physical health interventions should examine the effect they have on access to physical health-care services for mental health clients. Interventions incorporating a cost analysis may assist to determine potential savings in healthcare costs following lifestyle interventions for staff. Longitudinal studies should explore the effect of staff focused lifestyle interventions in improving the cardiometabolic risk factors and mental illness symptoms of their patients. Given the high dropout rate of participants completing fitness assessments, further interventions may need to incorporate additional strategies to retain those who are most deconditioned or inactive at baseline.

CONCLUSION

Exercise-focused brief interventions targeting mental health staff members may be effective in improving cardiorespiratory fitness and increasing physical activity levels. Improving the health of clinicians, increasing their familiarity with exercise professionals and improving their knowledge of exercise interventions may play a role in changing culture regarding physical health interventions within mental health settings. Effective novel interventions based in real-world settings could reduce the current health disparities for people with mental illness.

Contributors All authors were involved in the planning, conduct and reporting of the project.

Funding This project was funded by the District Mental Health programme; South Eastern Sydney Local Health District, Sydney.

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval The study protocol was approved by the South Eastern Sydney Local Health District Human Research Ethics Committee (HREC 15/054).

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available on reasonable request. Data are owned by the district mental health service of South Eastern Sydney Local Health District. Access to data repository and reuse is at the discretion of South Eastern Sydney Local Health District.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iD

Hamish Fibbins <http://orcid.org/0000-0002-2673-7866>

REFERENCES

- Baxter AJ, Harris MG, Khatib Y, *et al*. Reducing excess mortality due to chronic disease in people with severe mental illness: meta-review of health interventions. *Br J Psychiatry* 2016;208:322–9.
- Mangurian C, Newcomer JW, Modlin C, *et al*. Diabetes and cardiovascular care among people with severe mental illness: a literature review. *J Gen Intern Med* 2016;31:1083–91.
- Hjorthøj C, Stürup AE, McGrath JJ, *et al*. Years of potential life lost and life expectancy in schizophrenia: a systematic review and meta-analysis. *Lancet Psychiatry* 2017;4:295–301.
- Lawrence D, Hancock KJ, Kisely S. The gap in life expectancy from preventable physical illness in psychiatric patients in Western Australia: retrospective analysis of population based registers. *BMJ* 2013;346:f2539.
- Correll CU, Solmi M, Veronese N, *et al*. Prevalence, incidence and mortality from cardiovascular disease in patients with pooled and specific severe mental illness: a large-scale meta-analysis of 3,211,768 patients and 113,383,368 controls. *World Psychiatry* 2017;16:163–80.
- Vancampfort D, Stubbs B, Mitchell AJ, *et al*. Risk of metabolic syndrome and its components in people with schizophrenia and related psychotic disorders, bipolar disorder and major depressive disorder: a systematic review and meta-analysis. *World Psychiatry* 2015;14:339–47.
- Alvarez-Jiménez M, González-Blanch C, Crespo-Facorro B, *et al*. Antipsychotic-Induced weight gain in chronic and first-episode psychotic disorders: a systematic critical reappraisal. *CNS Drugs* 2008;22:547–62.
- Teasdale SB, Ward PB, Rosenbaum S, *et al*. Solving a weighty problem: systematic review and meta-analysis of nutrition interventions in severe mental illness. *Br J Psychiatry* 2017;210:110–8.
- Stubbs B, Williams J, Gaughran F, *et al*. How sedentary are people with psychosis? A systematic review and meta-analysis. *Schizophr Res* 2016;171:103–9.
- Mitchell AJ, Vancampfort D, De Hert M, *et al*. Do people with mental illness receive adequate smoking cessation advice? A systematic review and meta-analysis. *Gen Hosp Psychiatry* 2015;37:14–23.
- Firth J, Cotter J, Elliott R, *et al*. A systematic review and meta-analysis of exercise interventions in schizophrenia patients. *Psychol Med* 2015;45:1343–61.
- Firth J, Stubbs B, Rosenbaum S, *et al*. Aerobic exercise improves cognitive functioning in people with schizophrenia: a systematic review and meta-analysis. *Schizophr Bull* 2017;43:sbw115.
- Stubbs B, Vancampfort D, Hallgren M, *et al*. EPA guidance on physical activity as a treatment for severe mental illness: a meta-review of the evidence and position statement from the European psychiatric association (EPA), supported by the International organization of physical therapists in mental health (IOPTMH). *Eur Psychiatry* 2018;54:124–44.
- Stewart R. Mental disorders and mortality: so many publications, so little change. *Acta Psychiatr Scand* 2015;132:410–1.
- Rebar AL, Taylor A. Physical activity and mental health; it is more than just a prescription. *Ment Health Phys Act* 2017;13:77–82.
- Kessler R, Glasgow RE. A proposal to speed translation of healthcare research into practice: dramatic change is needed. *Am J Prev Med* 2011;40:637–44.
- Taylor AH, Faulkner G. Evidence and theory into practice in different health care contexts: a call for more translational science. *Ment Health Phys Act* 2014;1:1–5.
- Brown CH, Curran G, Palinkas LA, *et al*. An overview of research and evaluation designs for dissemination and implementation. *Annu Rev Public Health* 2017;38:1–22.
- Liu NH, Daumit GL, Dua T, *et al*. Excess mortality in persons with severe mental disorders: a multilevel intervention framework and priorities for clinical practice, policy and research agendas. *World Psychiatry* 2017;16:30–40.
- Aschbrenner KA, Brunette MF, McElvery R, *et al*. Cigarette smoking and interest in quitting among overweight and obese adults with serious mental illness enrolled in a fitness intervention. *J Nerv Ment Dis* 2015;203:473–6.
- Aschbrenner KA, Mueser KT, Bartels SJ, *et al*. Perceived social support for diet and exercise among persons with serious mental illness enrolled in a healthy lifestyle intervention. *Psychiatr Rehabil J* 2013;36:65–71.
- Fie S, Norman IJ, While AE. The relationship between physicians' and nurses' personal physical activity habits and their health-promotion practice: A systematic review. *Health Educ J* 2013;72:102–19.
- Stanton R, Reaburn P, Happell B. Barriers to exercise prescription and participation in people with mental illness: the perspectives of nurses working in mental health. *J Psychiatr Ment Health Nurs* 2015;22:440–8.
- Bartels S, Brunette M, Aschbrenner K, *et al*. Implementation of a system-wide health promotion intervention to reduce early mortality in high risk adults with serious mental illness and obesity. *Implement Sci* 2015;10:A15.
- Phelan M, Stradins L, Morrison S. Physical health of people with severe mental illness: can be improved if primary care and mental health professionals pay attention to it. *BMJ* 2001;322:443–4.

- 26 Fribbins H, Ward PB, Watkins A, *et al.* Improving the health of mental health staff through exercise interventions: a systematic review. *J Ment Health* 2018;27:184–91.
- 27 Rosenbaum S, Ward PB, Baldeo R, *et al.* Changing health workforce attitudes to promote improved physical health in mental health service users: keeping our staff in mind (KoSiM). *Health Promot J Austral* 2020;2.
- 28 Thomas S, Reading J, Shephard RJ. Revision of the physical activity readiness questionnaire (PAR-Q). *Can J Sport Sci* 1992.
- 29 Astrand I. *Aerobic work capacity in men and women: with special reference to age*. Norstedt, 1960.
- 30 American College of Sports Medicine. *ACSM's guidelines for exercise testing and prescription*. Lippincott Williams & Wilkins, 2013.
- 31 Craig CL, Marshall AL, Sjöström M, *et al.* International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc* 2003;35:1381–95.
- 32 Leong DP, Teo KK, Rangarajan S, *et al.* Reference ranges of handgrip strength from 125,462 healthy adults in 21 countries: a prospective urban rural epidemiologic (PURE) study. *J Cachexia Sarcopenia Muscle* 2016;7:535–46.
- 33 Leong DP, Teo KK, Rangarajan S, *et al.* Prognostic value of grip strength: findings from the prospective urban rural epidemiology (PURE) study. *Lancet* 2015;386:266–73.
- 34 Firth J, Firth JA, Stubbs B, *et al.* Association between muscular strength and cognition in people with major depression or bipolar disorder and healthy controls. *JAMA Psychiatry* 2018;75:740–6.
- 35 Cohen J. *Statistical power analysis for the social sciences*, 1988.
- 36 Swank AM, Horton J, Fleg JL, *et al.* Modest increase in peak VO₂ is related to better clinical outcomes in chronic heart failure patients: results from heart failure and a controlled trial to investigate outcomes of exercise training. *Circ Heart Fail* 2012;5:579–85.
- 37 Harber MP, Kaminsky LA, Arena R, *et al.* Impact of cardiorespiratory fitness on all-cause and disease-specific mortality: advances since 2009. *Prog Cardiovasc Dis* 2017;60:11–20.
- 38 Myers J, McAuley P, Lavie CJ, *et al.* Physical activity and cardiorespiratory fitness as major markers of cardiovascular risk: their independent and interwoven importance to health status. *Prog Cardiovasc Dis* 2015;57:306–14.
- 39 Mandsager K, Harb S, Cremer P, *et al.* Association of cardiorespiratory fitness with long-term mortality among adults undergoing exercise treadmill testing. *JAMA Netw Open* 2018;1:e183605.
- 40 Fribbins H, Czosnek L, Stanton R, *et al.* Self-reported physical activity levels of the 2017 Royal Australian and New Zealand College of psychiatrists (RANZCP) conference delegates and their exercise referral practices. *J Ment Health* 2018:1–8.
- 41 Australian Bureau of Statistics. 4364.0.55.004 - Australian Health Survey: Physical Activity, 2011–12, 2015. Available: <http://www.abs.gov.au/ausstats/abs@.nsf/lookup/D4495467B7F7EB01CA257BAC0015F593?opendocument>
- 42 Gates AB, Kerry R, Moffatt F, *et al.* Movement for movement: exercise as everybody's business? *Br J Sports Med* 2017;51:767–8.
- 43 Oliver D. David Oliver: fighting pyjama paralysis in hospital wards. *BMJ* 2017;357:j2096.
- 44 Rahman MS, Helgadóttir B, Hallgren M, *et al.* Cardiorespiratory fitness and response to exercise treatment in depression. *BJPsych Open* 2018;4:346–51.
- 45 Stubbs B, Rosenbaum S, Vancampfort D, *et al.* Exercise improves cardiorespiratory fitness in people with depression: a meta-analysis of randomized control trials. *J Affect Disord* 2016;190:249–53.
- 46 Vancampfort D, Rosenbaum S, Ward PB, *et al.* Exercise improves cardiorespiratory fitness in people with schizophrenia: a systematic review and meta-analysis. *Schizophr Res* 2015;169:453–7.
- 47 Stanton R, Rosenbaum S, Lederman O, *et al.* Implementation in action: how Australian exercise Physiologists approach exercise prescription for people with mental illness. *J Ment Health* 2018;27:150–6.
- 48 Rosenbaum S, Hobson-Powell A, Davison K, *et al.* The role of sport, exercise, and physical activity in closing the life expectancy gap for people with mental illness: an international consensus statement by exercise and sports science Australia, American College of sports medicine, British association of sport and exercise science, and sport and exercise science New Zealand. *Transl J Am Coll Sport Med* 2018;3:72–3.