Scientific Research Publishing

Psychology, 2024, 15, 1208-1220
https://www.scirp.org/journal/psych
ISSN Online: 2152-7199
ISSN Print: 2152-7180

"Well-Track" Healthy Lifestyle (Physical Activity, Sleep Hygiene, Diet, Wearable Activity Tracker) Coaching in Severe Mental Illness (SMI)

Chris Griffiths[1*], Ksenija da Silva[2], Alice Sheldon[1], Gerry Smith[1]

[1]Research and Innovation, Northamptonshire Healthcare NHS Foundation Trust (NHFT), Northampton, UK
[2]Centre for Healthcare and Communities, Coventry University, Coventry, UK
Email: *Chris.Griffiths@nhft.nhs.uk

How to cite this paper: Griffiths, C., da Silva, K., Sheldon, A., & Smith, G. (2024). "Well-Track" Healthy Lifestyle (Physical Activity, Sleep Hygiene, Diet, Wearable Activity Tracker) Coaching in Severe Mental Illness (SMI). *Psychology, 15,* 1208-1220.
https://doi.org/10.4236/psych.2024.157071

Received: June 27, 2024
Accepted: July 26, 2024
Published: July 29, 2024

Abstract

Background: People who experience Severe Mental Illness (SMI) often have low levels of physical activity, high levels of sedentary behaviour, poor diet, and sleep problems. These factors are linked to worse mental health symptoms, lower wellbeing, greater hopelessness, lower quality-of-life, and physical health-related diseases, including cardiovascular disease, stroke, hypertension, osteoarthritis, cancer, chronic obstructive pulmonary disease, obesity, and diabetes, contributing to 15 - 20 years reduced life expectancy. **Purpose/Aim:** This study investigates the impact of Well-Track healthy lifestyle intervention in SMI, it addresses the question: "What is the effect of Well-Track on mental wellbeing and sleep quality/insomnia for SMI patients?". **Methods:** An open-label patient cohort design with no control group. Pre-intervention, 4-week and 8-week intervention assessments using participant self-report measures: Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) and Sleep Conditioning Index (SCI). Participants were seventy-six Community Mental Health Team (CMHT) participants, 35 males and 41 females, with an age range of 20 - 65, and average age of 41 years. An eight-week intervention: a free-to-keep wearable tracker (instructions, set up, and access to apps), exercise, diet and sleep hygiene advice, a motivational interview and goal-setting session and two follow-up support sessions with a health coach. **Results:** WEMWBS scores significantly improved, from 37.52 (*SD* 10.18) to 42.35 (*SD* 7.14) at 4 weeks and to 44.06 (*SD* 6.03) at 8 weeks, with large effect sizes. SCI scores significantly improved, from 12.03 (*SD* 7.29) to 15.45 (*SD* 8.00) at 4 weeks and to 17.26 (*SD* 8.12) at 8 weeks, with large effect sizes. **Conclusion:** Well-Track was integrated into a SMI physical health check service and was found to be beneficial in terms of improving wellbeing and sleep quality and

reducing incidence of insomnia. Well-Track could be delivered through all CMHT and SMI physical health check services to promote healthy lifestyle behaviours.

Keywords

Diet, Severe Mental Illness, Exercise, Insomnia, Wearable, Physical Activity, Sleep, Health Coaching

1. Introduction

Severe Mental Illnesses (SMIs) are psychological problems causing severe functional and occupational impairment and include diagnoses of psychosis, schizophrenia, and bipolar disorder; the prevalence of SMI in adults is 0.9%: over 400,000 people (Public Health England, 2018). Lack of physical activity, poor diet and poor quality of sleep are contributory factors to rates of chronic physical health diseases that are many times higher for those with SMI than the general population, resulting in reduced life expectancy in SMI of 15 to 20 years (Hjorthøj et al., 2017).

Levels of physical activity are low in people who experience SMI and are linked to more depression symptoms, lower wellbeing, greater hopelessness, lower quality-of-life, and physical health diseases, such as: Cardiovascular Disease (CVD), stroke, cancer, hypertension, osteoarthritis, diabetes, and Chronic Obstructive Pulmonary Disease (COPD) (Rhodes et al., 2017; Schuch et al., 2017; Soundy et al., 2013; Vancampfort et al., 2015).

Within three months of commencing antipsychotic medication, patients experience rapid increases in body weight (Correll et al., 2009). Weight gain is a cause of distress, reduced self-worth, poor sleep, and less physical activity (Watkins et al., 2020; Hargens et al., 2013).

Sleep problems are common in people with SMI (rates of 80% reported) and impact negatively on functioning, wellbeing and mental health (Blanchard et al., 2020; Davies et al., 2017; Reeve et al., 2019; Waite et al., 2016). Poor sleep is associated with reduced quality of life, increased suicide risk, cognitive impairment, and worse functioning and mental health symptoms (Hofstetter et al., 2005; Pompili et al., 2009; Wulff & Joyce, 2011; Bromundt et al., 2011; Mulligan et al., 2016; Ong et al., 2020). Poor sleep has a negative impact on social and occupational functioning (Faulkner & Bee, 2017), emotional distress, fatigue, psychotic symptoms, reduction in daytime activities, and capacity to cope with distressing hallucinations (voices) (Waite et al., 2016).

Psychological barriers to physical activity and healthy lifestyles include psychotic symptoms, anxiety, low motivation, and low self-efficacy (Brooke et al., 2020; Carney et al., 2017). Additional barriers include social withdrawal due to poor mental health, stigma, fear of others, and low self-esteem (Carney et al., 2017).

There can be practical issues and barriers to adopting a healthy lifestyle, such as: cost, time, and insufficient skills and knowledge (Carney et al., 2017).

For people with SMI, engaging in physical exercise is associated with improved quality of life, cognition, functioning, physical health, and reduced psychotic symptomatology (Mittal et al., 2017). The physical demands of exercise can temporarily subdue positive symptoms and act as a distraction from intrusive voices, delusions, and paranoia; exercise can reduce negative symptoms and depression, as well as improve energy, mood, and motivation levels—partially through stimulating endorphins release (Mason & Holt, 2012; Firth et al., 2018). People with SMI report that exercise can alleviate psychiatric symptoms, improve mental health, improve wellbeing, reduce stress, improve hopefulness, enhance self-confidence, boost energy levels, and provide a sense of achievement (Firth et al., 2018; Larsen et al., 2019). Achieving exercise goals increases self-efficacy and confidence in other areas of life, such as psychosocial functioning (Firth et al., 2018).

In patients with SMI, a good night's sleep is associated with wellbeing, happiness, social relationship satisfaction, contentment, feeling energised, improved mental health, and ability to cope; these factors are related to recovery and engaging in and enjoying life (Waite et al., 2016; Griffiths et al., 2022a, 2022b; Schlarb et al., 2015). A virtuous cycle exists whereby sleep and physical activity result in greater self-esteem and confidence, which further enhances motivation and capability to engage socially and in healthy lifestyle activities (Carney et al., 2017). Adoption of a healthy diet can result in improved physical health, self-worth, sleep quality, functioning, and physical activity (Watkins et al., 2020; Hargens et al., 2013). Sleep hygiene in SMI can improve quality of sleep (Klingaman et al., 2015; Davies et al., 2017).

Feasibility and acceptability of consumer sleep monitoring technology (e.g. Fitbit) in SMI has been found (Aledavood et al., 2019). Using a wearable activity tracker encourages increases in physical activity, self-awareness, motivation, goal-setting, diet, and healthier lifestyles (Naslund et al., 2016; Chum et al., 2017). A wearable activity tracker sleep detection is 95% accurate (Beattie et al., 2017). Activity trackers can significantly reduce body weight due to improvements in self-regulated lifestyle (Kooiman et al., 2018). A wearable activity tracker can be a valuable part of lifestyle interventions for people with SMI to reduce CVD risk and weight and improve Cardiorespiratory Fitness (CRF) (Aschbrenner et al., 2021).

A systematic review and meta-analysis of wearable activity tracker-based interventions for healthy lifestyles (no exclusion on participant characteristics) found a significant reduction in weight and increases in physical activity (steps) and moderate-to-vigorous physical activity; the review concluded that goal setting was a condition for better outcomes (Ringeval et al., 2020). Motivational interviewing and goal setting are effective tools for motivating people to engage in healthy lifestyle behaviours (Hardcastle et al., 2015). Interventions to enhance

motivation for healthier lifestyles can help elicit long-term healthy lifestyle behaviour change (McGrane et al., 2015). Grounding healthy lifestyle intervention programmes in behaviour change theory can foster self-efficacy and increase the likelihood of intervention efficacy (Smith et al., 2020).

A large RCT of structured lifestyle group education in schizophrenia highlighted the need and patient demand for interventions but had little effect (Holt et al., 2019). However, individualised physical activity programmes in early psychosis have been shown to be effective in improving symptomatology, functioning and physical wellbeing (Firth et al., 2018).

In our three mental health service un-controlled pilots, Well-Track was delivered: the provision of a Fitbit and its software apps, sleep hygiene and physical activity guidance, and three engagement sessions with a clinician. Combining data (n = 43) from pilots one and two, the wellbeing (WEMWBS) improved statistically significantly from Week 1 (49.8) to week 4 (52.9), Z = −2.09, p = .037 (Griffiths et al., 2021, 2022a). In the second pilot (n=23), we found that Positive and Negative Affect Schedule (PANAS) negative affect dropped statistically significantly (indicating that the patients had lower levels of negative affect at 4 weeks) and PANAS positive affect was reaching statistical significance (Griffiths et al., 2022a). In the third pilot (n = 24) there was a significant improvement in WEMWBS scores (large effect size), sleep quality (Sleep Condition Indicator, SCI), and depression (PHQ-9) (large effect size), and a small non-significant reduction in weight (Griffiths et al., 2023a).

Analysis of twenty-seven participant interviews found that most actively used the Fitbit and its software apps to gain information and feedback, and set goals to make changes to their lifestyle and daily routines to improve self-confidence, quality of sleep, levels of physical activity, diet, and exercise (Griffiths et al., 2021, 2022b, 2023b). Most participants found Well-Track acceptable and attended all three sessions and reported increased physical activity/exercise and improved sleep and diet. It was found that Fitbit app feedback empowers patients to take control of their own health and increases healthy lifestyle motivation, awareness, and adoption (Griffiths et al., 2021, 2022b, 2023b).

All patients with SMI are provided with at least one comprehensive 12-point physical health review annually (NHS England, 2024). Despite calls to "don't just screen, intervene" (NHS England, 2017) to improve physical health, there is a lack of effective healthy lifestyle interventions at this review point. This present study investigates the impact of Well-Track intervention in SMI, it addresses the question: "What is the effect of Well-Track on mental wellbeing and sleep quality/insomnia for SMI patients?" Our hypothesis was that Well-Track will have a positive impact on mental wellbeing, and sleep quality/insomnia in SMI patients.

2. Methods

2.1. Design

Open-label patient cohort design with no control group.

2.2. Participants

The sample was recruited from people using CMHT services within the United Kingdom's (UK) National Health Service (NHS). Participants were included if they were aged 18 or over, had the mental capacity to consent, provided informed consent, and had the ability to understand verbal English. Exclusion criteria were a medical reason meaning they could not wear a watch on their wrist.

2.3. Setting

The intervention was implemented whilst participants were under the care of a Community Mental Health Team (CMHT). The health coach was based in a SMI physical health check team.

2.4. Intervention

Well-Track intervention is an eight-week programme and comprises one session of a brief motivational interview and completion of a goal setting workbook, a free to keep "Fitbit", sleep hygiene, diet and physical activity information sheets and verbal advice, and two patient engagement, discussion, feedback, and support follow-up sessions with a health coach.

2.5. Procedure

The project was undertaken from October 2023 to June 2024. Approval for the study was gained from the NHS healthcare trust in which the services were based (Reference number for approval: IFWT3). The study was undertaken in accordance with the Declaration of Helsinki. Patients were selected if they met inclusion/exclusion criteria and then provided with information about Well-Track and the evaluation. Informed consent was sought and required to begin Well-Track. Patients could withdraw consent or stop engagement with Well-Track at any point without the need to provide a reason. Following informed consent, routinely collected demographic data (age and sex) from patient records was extracted. At the data collection points participants completed the two self-report questionnaires.

2.6. Measures

- Insomnia: Sleep Condition Indicator (SCI) is an eight item self-report measure of insomnia disorder and sleep quality; it is valid, reliable, and sensitive to change in insomnia severity (Espie at al., 2014). Probable insomnia score is ≤16.
- Wellbeing: Warwick-Edinburgh Mental Wellbeing Scale-14 (WEMWBS) is a 14 item self-report measure of psychological wellbeing; is valid, reliable, and acceptable (Tennant et al., 2007), responsive to change, and suitable for evaluation of interventions at the individual level (Maheswaran et al., 2012). The general population mean WEMWBS score is 51.0 (Tennant et al., 2007).

2.7. Methodology and Analysis

Repeated measures ANOVAs were conducted to determine whether there were statistically significant differences in WEMWBS and SCI scores over the course of the 8-week intervention. Spearman's rho was used to calculate correlations. Data were analysed using the statistical software package SPSS Statistics 26.

3. Results

Table 1. Characteristics of participants (n = 76) at baseline, 4 and 8 weeks

	Baseline		4 weeks		8 weeks	
Variable	*Mean* (*SD*)	Range	*Mean* (*SD*)	Range	*Mean* (SD)	Range
WEMWBS	37.52 (10.18)	14 - 57	42.35 (7.14)	26 - 55	44.06 (6.03)	31 - 55
SCI	12.03 (7.29)	0 - 31	15.34 (8.00)	0 - 31	17.26 (8.12)	0 - 32

Thirty-five participants were males and forty-one were females (five were missing). Mean age was 41.08 years (SD = 11.49), with an age range of 20 - 65 years (see Table 1). The baseline WEMWBS mean score of 37.5 was lower than the general population norms for England (Tennant et al., 2007). Based on SCI scores, 24 participants (31.6%) would meet a diagnosis of probable insomnia (Espie et al., 2014).

Prior to statistical analysis, data screening was conducted to confirm that the dataset met the assumptions required of the general linear model. There were no outliers in the data, the Shapiro Wilk's test assessed all measures were normally distributed, and Mauchly's test of sphericity indicated that the assumption of sphericity had not been violated for the SCI scale.

WEMWBS data Mauchly's test of sphericity indicated that the assumption of sphericity had been violated, $\chi^2(2) = .75$, $p = .016$. Due to the estimated epsilon value of .840, Huynh-Feldt correction was used. The increase of the WEMWBS scores was statistically significant at both points during the intervention, $F(50.4, 1.7) = 9.946$, $p < .001$, partial $\eta^2 = .25$. The large effect size confers 25% of the improvement in WEMWBS was accounted for by the intervention. Post-hoc analysis with Bonferroni adjustment revealed that there was an increase in the WEMWBS scores from baseline (M = 37.52, SD = 10.18) to week 4 (M = 42.35, SD = 7.14), a statistically significant mean increase of 4.84 95% CI [−8.96, −.72], $p = .017$. Similarly, an increase in the WEMWBS scores was observed between baseline and week 8 (M = 44.06, SD = 6.03), a statistically significant increase of 6.55 95% CI [−11.03, −2.07], $p = .003$. Wellbeing improvement was maintained to week 8.

For SCI data, the assumptions for repeated measures ANOVA were met and Mauchly's test of sphericity indicated that the assumption of sphericity had not been violated, $\chi^2(2) = .91$, $p = .266$. An overall change in sleep index score was statistically significantly improved following the intervention, $F(2,60) = 13.49$, $p < .001$, partial $\eta^2 = .310$. A post hoc analysis with a Bonferroni adjustment re-

vealed there was an improvement from baseline (M = 12.03, SD = 7.29) to week 4 (M = 15.45, SD = 8.00), a statistically significant mean improvement of −3.42 95% CI [−5.64, −1.20], p = .001. The average sleep index improved further by week 8 (M = 17.26, SD = 8.12), −5.23 95%CI [−7.85, −2.60], p < .001. At the end of week 8, 14 patients (18.3%) met a diagnosis of probable insomnia (Espie et al., 2014), a remission rate of 41.7%.

4. Discussion

This study investigated the impact of Well-Track on mental wellbeing, and sleep quality/insomnia. Well-track was successfully delivered through a SMI physical health check service, and we found most SMI patients will choose to undertake Well-Track and complete all three sessions, providing evidence of feasibility and acceptability. The findings showed that SMI patients could benefit from Well-Track in terms of reducing symptoms of insomnia and improving mental wellbeing and sleep quality. People continued to improve from 4 to 8 weeks, i.e. from the second session to the third indicating a cumulative effect of the intervention.

Healthy lifestyles (diet, physical activity, and sleep quality) are linked to positive psychological wellbeing (Johnson et al., 2017; Harvey et al., 2020; Tamminen et al., 2020). Participant improvements on the WEMWBS measure indicate a positive impact of Well-Track on individuals' wellbeing, subjective happiness, life satisfaction, self-realisation, and psychological functioning. These are all factors which are important for quality of life, coping, and thriving.

Whilst there are no directly comparable interventions, the improvement in wellbeing through Well-Track was greater than an intervention providing access to community-based physical activities for participants who were mental health service users (Malcolm et al., 2013), perhaps highlighting the added value of an individualised approach using a motivational interview, goal setting, and feedback. The findings indicate that this study's approach (providing goal setting, progress monitoring, structure, and support to assist people in physical health and lifestyle management to encourage healthy lifestyles and increase health literacy) supports the evidence of the value of this approach (Pedley et al., 2018).

Reduction in insomnia and improvements in sleep quality seen following Well-Track can have a positive impact on social and occupational functioning, capacity to cope with distressing mental health symptoms, wellbeing, mental health, and quality of life (Blanchard et al., 2020; Davies et al., 2017; Reeve et al., 2019; Waite et al., 2016; Hofstetter et al., 2005; Pompili et al., 2009; Wulff & Joyce, 2011; Bromundt et al., 2011; Mulligan et al., 2016; Ong et al., 2020; Faulkner & Bee, 2017; Waite et al., 2016). A good night's sleep allows people to better able engage in daily activities, feel more motivated and energised, and cope with challenges that they face contributing to mental health recovery and enjoying life (Waite et al., 2016; Griffiths et al., 2022a, 2022b). A virtuous cycle can be created whereby good quality sleep means people feel able to engage in more physical activity increasing physical tiredness that encourages better sleep; this can en-

hance motivation and capability to engage socially and in healthy lifestyle activities and result in greater self-esteem and confidence (Carney et al., 2017).

Evidence indicates that sleep disturbance plays a role in the pathogenesis of schizophrenia (Lunsford-Avery et al., 2015); and sleep problems are common in people with SMI (Blanchard et al., 2020; Davies et al., 2017; Reeve et al., 2019; Waite et al., 2016). Remission rates of 42% indicate the value of Well-Track in treating insomnia. NICE recommendations for the treatment of short-term insomnia are non-pharmacological interventions, e.g. insomnia Cognitive Behavioural Therapy (iCBT), as the first method and, where this fails, a follow-up with a brief course of a non-benzodiazepine hypnotic prescription (NICE, 2020). Further investigation could consider if Well-Track may be a useful and potentially more acceptable and lower-cost intervention for insomnia than either iCBT or non-benzodiazepine hypnotic prescription.

5. Limitations

Study limitations include the lack of control group. A confounding factor is that the participants would have been receiving support and treatment from CMHT services during the Well-Track intervention. People who agreed to participate were self-selected; thus, it is possible more participants with better than average mental health for people with SMI agreed to participate. The participants were from a single UK county reducing generalisability.

6. Conclusion

Well-Track has a positive impact on insomnia/sleep quality and wellbeing. Benefits are seen at 4 weeks and improved further at 8 weeks. In future research, an appropriately powered multi-site Randomised Controlled Trial (RCT) with longer-term follow-up to investigate efficacy of Well-Track could provide further evidence.

Improved mental and physical health and wellbeing are key aims of SMI services. There is a lack of effective healthy lifestyle interventions available in SMI services (Larsen et al., 2019); Well-Track has been found to be an effective option that could potentially bridge this gap. These results show that CMHT service users can benefit from this relatively simple and low-cost intervention that meets requirements of service delivery goals and Key Performance Indicators (KPIs). A manualised version of Well-Track is now available to access free of charge via: https://www.nhft.nhs.uk/research/.

Acknowledgements

We wish to thank the participants and the staff at the NHS Trust for their support in recruitment.

Funding

This project is funded by the National Institute for Health Research (NIHR) East

Midlands Clinical Research Network (CRN). The views expressed are those of the authors and not necessarily those of the NIHR.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

Aledavood, T., Torous, J., Triana Hoyos, A. M., Naslund, J. A., Onnela, J., & Keshavan, M. (2019). Smartphone-based Tracking of Sleep in Depression, Anxiety, and Psychotic Disorders. *Current Psychiatry Reports, 21,* Article No. 49. https://doi.org/10.1007/s11920-019-1043-y

Aschbrenner, K. A., Naslund, J. A., Gorin, A. A., Mueser, K. T., Browne, J., Wolfe, R. S. et al. (2021). Group Lifestyle Intervention with Mobile Health for Young Adults with Serious Mental Illness: A Randomized Controlled Trial. *Psychiatric Services, 73,* 141-148. https://doi.org/10.1176/appi.ps.202100047

Beattie, Z., Oyang, Y., Statan, A., Ghoreyshi, A., Pantelopoulos, A., Russell, A. et al. (2017). Estimation of Sleep Stages in a Healthy Adult Population from Optical Plethysmography and Accelerometer Signals. *Physiological Measurement, 38,* 1968-1979. https://doi.org/10.1088/1361-6579/aa9047

Blanchard, J. J., Savage, C. L. G., Orth, R. D., Jacome, A. M., & Bennett, M. E. (2020). Sleep Problems and Social Impairment in Psychosis: A Transdiagnostic Study Examining Multiple Social Domains. *Frontiers in Psychiatry, 11,* Article 486. https://doi.org/10.3389/fpsyt.2020.00486

Bromundt, V., Köster, M., Georgiev-Kill, A., Opwis, K., Wirz-Justice, A., Stoppe, G. et al. (2011). Sleep-Wake Cycles and Cognitive Functioning in Schizophrenia. *British Journal of Psychiatry, 198,* 269-276. https://doi.org/10.1192/bjp.bp.110.078022

Brooke, L. E., Gucciardi, D. F., Ntoumanis, N., & Lin, A. (2020). Qualitative Investigation of Perceived Barriers to and Enablers of Sport Participation for Young People with First Episode Psychosis. *Early Intervention in Psychiatry, 14,* 293-306. https://doi.org/10.1111/eip.12854

Carney, R., Cotter, J., Bradshaw, T., & Yung, A. R. (2017). Examining the Physical Health and Lifestyle of Young People at Ultra-High Risk for Psychosis: A Qualitative Study Involving Service Users, Parents and Clinicians. *Psychiatry Research, 255,* 87-93. https://doi.org/10.1016/j.psychres.2017.05.023

Chum, J., Kim, M. S., Zielinski, L., Bhatt, M., Chung, D., Yeung, S. et al. (2017). Acceptability of the Fitbit in Behavioural Activation Therapy for Depression: A Qualitative Study. *Evidence Based Mental Health, 20,* 128-133. https://doi.org/10.1136/eb-2017-102763

Correll, C. U. et al. (2009). Cardiometabolic Risk of Second-Generation Antipsychotic Medications during First-Time Use in Children and Adolescents. *JAMA, 302,* 1765-1773. https://doi.org/10.1001/jama.2009.1549

Davies, G., Haddock, G., Yung, A. R., Mulligan, L. D., & Kyle, S. D. (2017). A Systematic Review of the Nature and Correlates of Sleep Disturbance in Early Psychosis. *Sleep Medicine Reviews, 31,* 25-38. https://doi.org/10.1016/j.smrv.2016.01.001

Espie, C. A., Kyle, S. D., Hames, P., Gardani, M., Fleming, L., & Cape, J. (2014). The Sleep Condition Indicator: A Clinical Screening Tool to Evaluate Insomnia Disorder. *BMJ Open, 4,* e004183. https://doi.org/10.1136/bmjopen-2013-004183

Faulkner, S., & Bee, P. (2017). Experiences, Perspectives and Priorities of People with

Schizophrenia Spectrum Disorders Regarding Sleep Disturbance and Its Treatment: A Qualitative Study. *BMC Psychiatry, 17,* Article No. 158. https://doi.org/10.1186/s12888-017-1329-8

Firth, J., Carney, R., Elliott, R., French, P., Parker, S., McIntyre, R. et al. (2018). Exercise as an Intervention for First-Episode Psychosis: A Feasibility Study. *Early Intervention in Psychiatry, 12,* 307-315. https://doi.org/10.1111/eip.12329

Griffiths, C., da Silva, K., Hina, F., Jugon, S., Willis, G., Yardley, S. et al. (2022a). Effectiveness of a Fitbit Based Sleep and Physical Activity Intervention in an Early Intervention Psychosis (EIP) Service. *Open Journal of Psychiatry, 12,* 188-202. https://doi.org/10.4236/ojpsych.2022.122015

Griffiths, C., da Silva, K., Jugon, S., Jiang, H., Rogers, R., Althorpe, T. et al. (2023a). "Well-Track": Fitbit Based Physical Activity and Sleep Hygiene Intervention for Early Intervention in Psychosis (EIP) and At-Risk Mental State (ARMS) Service Patients. *Open Journal of Psychiatry, 13,* 246-261. https://doi.org/10.4236/ojpsych.2023.134020

Griffiths, C., Hina, F., Pollard, L., Jugon, S., Sam, M., & Kelbrick, M. (2021). A Qualitative Study of Early Intervention Psychosis (EIP) Service Patient's Experience of Sleep, Exercise, Sleep Hygiene Advice and Fitbit Wearable Activity and Sleep Tracker. *Open Journal of Psychiatry, 11,* 91-106. https://doi.org/10.4236/ojpsych.2021.112009

Griffiths, C., Walker, K., & Jiang, H. (2023b). Experience and Impact of the "Well-Track" Physical Activity and Sleep Tracker Based Healthy Lifestyle Intervention for Patients in an Early Intervention in Psychosis (EIP) Service. *Open Journal of Psychiatry, 13,* 73-93. https://doi.org/10.4236/ojpsych.2023.132009

Griffiths, C., Walker, K., & Leathlean, C. (2022b). An Exploration of Patient Experience of Sleep, Physical Activity, and Exercise in Early Psychosis. *Psychosis, 15,* 319-331. https://doi.org/10.1080/17522439.2022.2064907

Hardcastle, S. J., Hancox, J., Hattar, A., Maxwell-Smith, C., Thøgersen-Ntoumani, C., & Hagger, M. S. (2015). Motivating the Unmotivated: How Can Health Behavior Be Changed in Those Unwilling to Change? *Frontiers in Psychology, 6,* Article 835. https://doi.org/10.3389/fpsyg.2015.00835

Hargens, T., Kaleth,, Edwards,, & Butner, (2013). Association between Sleep Disorders, Obesity, and Exercise: A Review. *Nature and Science of Sleep, 5,* 27-35. https://doi.org/10.2147/nss.s34838

Harvey, C., Ratcliffe, P., & Gulliford, M. C. (2020). Well-Being, Physical Activity and Long-Term Conditions: Cross-Sectional Analysis of Health Survey for England 2016. *Public Health, 185,* 368-374. https://doi.org/10.1016/j.puhe.2020.06.013

Hjorthøj, C., Stürup, A. E., McGrath, J. J., & Nordentoft, M. (2017). Years of Potential Life Lost and Life Expectancy in Schizophrenia: A Systematic Review and Meta-Analysis. *The Lancet Psychiatry, 4,* 295-301. https://doi.org/10.1016/s2215-0366(17)30078-0

Hofstetter, J. R., Lysaker, P. H., & Mayeda, A. R. (2005). Quality of Sleep in Patients with Schizophrenia Is Associated with Quality of Life and Coping. *BMC Psychiatry, 5,* Article No. 13. https://doi.org/10.1186/1471-244x-5-13

Holt, R. I. G., Gossage-Worrall, R., Hind, D., Bradburn, M. J., McCrone, P., Morris, T. et al. (2019). Structured Lifestyle Education for People with Schizophrenia, Schizoaffective Disorder and First-Episode Psychosis (STEPWISE): Randomised Controlled Trial. *The British Journal of Psychiatry, 214,* 63-73. https://doi.org/10.1192/bjp.2018.167

Johnson, R., Robertson, W., Towey, M., Stewart-Brown, S., & Clarke, A. (2017). Changes over Time in Mental Well-Being, Fruit and Vegetable Consumption and Physical Activity in a Community-Based Lifestyle Intervention: A before and after Study. *Public Health, 146,* 118-125. https://doi.org/10.1016/j.puhe.2017.01.012

Klingaman, E. A., Palmer-Bacon, J., Bennett, M. E., & Rowland, L. M. (2015). Sleep Disorders among People with Schizophrenia: Emerging Research. *Current Psychiatry Reports, 17,* Article No. 79. https://doi.org/10.1007/s11920-015-0616-7

Kooiman, T. J. M., de Groot, M., Hoogenberg, K., Krijnen, W. P., van der Schans, C. P., & Kooy, A. (2018). Self-Tracking of Physical Activity in People with Type 2 Diabetes. *CIN: Computers, Informatics, Nursing, 36,* 340-349. https://doi.org/10.1097/cin.0000000000000443

Larsen, L. Q., Schnor, H., Tersbøl, B. P., Ebdrup, B. H., Nordsborg, N. B., & Midtgaard, J. (2019). The Impact of Exercise Training Complementary to Early Intervention in Patients with First-Episode Psychosis: A Qualitative Sub-Study from a Randomized Controlled Feasibility Trial. *BMC Psychiatry, 19,* Article No. 192. https://doi.org/10.1186/s12888-019-2179-3

Lunsford-Avery, J. R., LeBourgeois, M. K., Gupta, T., & Mittal, V. A. (2015). Actigraphic-Measured Sleep Disturbance Predicts Increased Positive Symptoms in Adolescents at Ultra High-Risk for Psychosis: A Longitudinal Study. *Schizophrenia Research, 164,* 15-20. https://doi.org/10.1016/j.schres.2015.03.013

Maheswaran, H., Weich, S., Powell, J., & Stewart-Brown, S. (2012). Evaluating the Responsiveness of the Warwick Edinburgh Mental Well-Being Scale (WEMWBS): Group and Individual Level Analysis. *Health and Quality of Life Outcomes, 10,* Article No. 156. https://doi.org/10.1186/1477-7525-10-156

Malcolm, E., Evans-Lacko, S., Little, K., Henderson, C., & Thornicroft, G. (2013). The Impact of Exercise Projects to Promote Mental Wellbeing. *Journal of Mental Health, 22,* 519-527. https://doi.org/10.3109/09638237.2013.841874

Mason, O. J., & Holt, R. (2012). Mental Health and Physical Activity Interventions: A Review of the Qualitative Literature. *Journal of Mental Health, 21,* 274-284. https://doi.org/10.3109/09638237.2011.648344

McGrane, N., Galvin, R., Cusack, T., & Stokes, E. (2015). Addition of Motivational Interventions to Exercise and Traditional Physiotherapy: A Review and Meta-Analysis. *Physiotherapy, 101,* 1-12. https://doi.org/10.1016/j.physio.2014.04.009

Mittal, V. A., Vargas, T., Juston Osborne, K., Dean, D., Gupta, T., Ristanovic, I. et al. (2017). Exercise Treatments for Psychosis: A Review. *Current Treatment Options in Psychiatry, 4,* 152-166. https://doi.org/10.1007/s40501-017-0112-2

Mulligan, L. D., Haddock, G., Emsley, R., Neil, S. T., & Kyle, S. D. (2016). High Resolution Examination of the Role of Sleep Disturbance in Predicting Functioning and Psychotic Symptoms in Schizophrenia: A Novel Experience Sampling Study. *Journal of Abnormal Psychology, 125,* 788-797. https://doi.org/10.1037/abn0000180

Naslund, J. A., Aschbrenner, K. A., Scherer, E. A., McHugo, G. J., Marsch, L. A., & Bartels, S. J. (2016). Wearable Devices and Mobile Technologies for Supporting Behavioral Weight Loss among People with Serious Mental Illness. *Psychiatry Research, 244,* 139-144. https://doi.org/10.1016/j.psychres.2016.06.056

NHS England (2017). *'Don't Just Screen, Intervene': Improved Guidance to Improve the Health of People Living with a Mental Illness.* https://www.gov.uk/government/news/dont-just-screen-intervene-improved-guidance-to-improve-the-health-of-people-living-with-a-mental-illness

NHS England (2024). *10 Key Actions: Improving the Physical Health of People Living with Severe Mental Illness.* https://www.england.nhs.uk/long-read/10-key-actions-improving-the-physical-health-of-people-living-with-severe-mental-illness/

NICE (2020). *Managing Short-Term Insomnia (Less than 3 Months Duration).*

https://cks.nice.org.uk/topics/insomnia/management/managing-insomnia/

Ong, W. J., Tan, X. W., Shahwan, S., Satghare, P., Cetty, L., Ng, B. T. et al. (2020). Association between Sleep Quality and Domains of Quality of Life amongst Patients with First Episode Psychosis. *Health and Quality of Life Outcomes, 18,* Article No. 114. https://doi.org/10.1186/s12955-020-01367-3

Pedley, R., Lovell, K., Bee, P., Bradshaw, T., Gellatly, J., Ward, K. et al. (2018). Collaborative, Individualised Lifestyle Interventions Are Acceptable to People with First Episode Psychosis; a Qualitative Study. *BMC Psychiatry, 18,* Article No. 111. https://doi.org/10.1186/s12888-018-1692-0

Pompili, M., Lester, D., Grispini, A., Innamorati, M., Calandro, F., Iliceto, P. et al. (2009). Completed Suicide in Schizophrenia: Evidence from a Case-Control Study. *Psychiatry Research, 167,* 251-257. https://doi.org/10.1016/j.psychres.2008.03.018

Public Health England (2018). *Severe Mental Illness (SMI) and Physical Health Inequalities: Briefing.* https://www.gov.uk/government/publications/severe-mental-illness-smi-physical-health-inequalities/severe-mental-illness-and-physical-health-inequalities-briefing

Reeve, S., Nickless, A., Sheaves, B., Hodgekins, J., Stewart, S. L. K., Gumley, A. et al. (2019). Sleep Duration and Psychotic Experiences in Patients at Risk of Psychosis: A Secondary Analysis of the EDIE-2 Trial. *Schizophrenia Research, 204,* 326-333. https://doi.org/10.1016/j.schres.2018.08.006

Rhodes, R. E., Janssen, I., Bredin, S. S. D., Warburton, D. E. R., & Bauman, A. (2017). Physical Activity: Health Impact, Prevalence, Correlates and Interventions. *Psychology & Health, 32,* 942-975. https://doi.org/10.1080/08870446.2017.1325486

Ringeval, M., Wagner, G., Denford, J., Paré, G., & Kitsiou, S. (2020). Fitbit-Based Interventions for Healthy Lifestyle Outcomes: Systematic Review and Meta-Analysis. *Journal of Medical Internet Research, 22,* e23954. https://doi.org/10.2196/23954

Schlarb, A. A., Claßen, M., Schuster, E. S., Neuner, F., & Hautzinger, M. (2015). Did You Sleep Well, Darling?—link between Sleep Quality and Relationship Quality. *Health, 7,* 1747-1756. https://doi.org/10.4236/health.2015.712190

Schuch, F., Vancampfort, D., Firth, J., Rosenbaum, S., Ward, P., Reichert, T. et al. (2017). Physical Activity and Sedentary Behavior in People with Major Depressive Disorder: A Systematic Review and Meta-analysis. *Journal of Affective Disorders, 210,* 139-150. https://doi.org/10.1016/j.jad.2016.10.050

Smith, J., Griffiths, L. A., Band, M., Hird-Smith, R., Williams, B., Bold, J. et al. (2020). Early Intervention in Psychosis: Effectiveness and Implementation of a Combined Exercise and Health Behavior Intervention within Routine Care. *Frontiers in Endocrinology, 11,* Article 577691. https://doi.org/10.3389/fendo.2020.577691

Soundy, A., Wampers, M., Probst, M., De Hert, M., Stubbs, B., Vancampfort, D. et al. (2013). Physical Activity and Sedentary Behaviour in Outpatients with Schizophrenia: A Systematic Review and Meta-analysis. *International Journal of Therapy and Rehabilitation, 20,* 588-595. https://doi.org/10.12968/ijtr.2013.20.12.588

Tamminen, N., Reinikainen, J., Appelqvist-Schmidlechner, K., Borodulin, K., Mäki-Opas, T., & Solin, P. (2020). Associations of Physical Activity with Positive Mental Health: A Population-Based Study. *Mental Health and Physical Activity, 18,* Article ID: 100319. https://doi.org/10.1016/j.mhpa.2020.100319

Tennant, R., Hiller, L., Fishwick, R., Platt, S., Joseph, S., Weich, S. et al. (2007). The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS): Development and UK Validation. *Health and Quality of Life Outcomes, 5,* Article No. 63. https://doi.org/10.1186/1477-7525-5-63

Vancampfort, D., Guelinkcx, H., Probst, M., Stubbs, B., Rosenbaum, S., Ward, P. B. et al. (2015). Associations between Metabolic and Aerobic Fitness Parameters in Patients with Schizophrenia. *Journal of Nervous & Mental Disease, 203,* 23-27. https://doi.org/10.1097/nmd.0000000000000229

Waite, F., Evans, N., Myers, E., Startup, H., Lister, R., Harvey, A. G. et al. (2016). The Patient Experience of Sleep Problems and Their Treatment in the Context of Current Delusions and Hallucinations. *Psychology and Psychotherapy: Theory, Research and Practice, 89,* 181-193. https://doi.org/10.1111/papt.12073

Watkins, A., Denney-Wilson, E., Curtis, J., Teasdale, S., Rosenbaum, S., Ward, P. B. et al. (2019). Keeping the Body in Mind: A Qualitative Analysis of the Experiences of People Experiencing First-Episode Psychosis Participating in a Lifestyle Intervention Programme. *International Journal of Mental Health Nursing, 29,* 278-289. https://doi.org/10.1111/inm.12683

Wulff, K., & Joyce, E. (2011). Circadian Rhythms and Cognition in Schizophrenia. *British Journal of Psychiatry, 198,* 250-252. https://doi.org/10.1192/bjp.bp.110.085068