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# Behavioral Interventions to Reduce Cardiovascular Risk Among People with Severe Mental Disorder

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## Keywords

cardiovascular disease risk, severe mental disorder, behavioral interventions, psychological treatments, multiple risk behaviors, early intervention

## Abstract

Cardiovascular disease (CVD) is the leading cause of death among people with severe mental disorder (SMD). CVD risk factors occur at the individual, health system, and socio-environmental levels and contribute not only to high rates of CVD but also to worsening mental health. While acknowledging this wider context, this review focuses on behavioral interventions for seven CVD risk behaviors—smoking, physical inactivity, excessive alcohol consumption, low fruit and vegetable intake, inadequate sleep, poor social participation, and poor medication adherence—that are common among people with SMD. We survey recent meta-reviews of the literature and then review additional key studies to provide clinical recommendations for behavioral interventions to reduce CVD risk among people with SMD. A transdiagnostic psychological approach from the start of mental health treatment, drawing upon multidisciplinary expertise to address multiple risk behaviors, is recommended.

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## INTRODUCTION

Severe mental disorder (SMD) refers to debilitating conditions that are closely associated with suffering, disability, and premature mortality (R. Aust. N.Z. Coll. Psychiatr. 2016). There is little consistency in how SMD is defined in practice; some narrower definitions focus on psychotic disorders, such as schizophrenia and bipolar disorder, while broader definitions include a wider range of disorders (Ruggeri et al. 2000). Consequently, in the present review, we include papers that provide a variety of definitions of SMD.

People with SMD have increased risk and severity of chronic physical diseases such as cardiovascular disease (CVD), type 2 diabetes, respiratory disease, and cancers, and these are the major causes of disability and loss of life (Jayatilleke et al. 2017). People with SMD die prematurely from these preventable physical diseases 15–20 years earlier than the general population (Nordentoft et al. 2013). They are the primary cause of death in people with schizophrenia or bipolar disorder, accounting for approximately 70% of all deaths (Walker et al. 2015). CVD, the focus of the present review, is the leading cause of death in people with SMD and contributes 17.4% and 22.0% of life years lost in men and women with SMD, respectively (Jayatilleke et al. 2017).

Although overall patterns of mortality are similar across countries, there are likely differences in which solutions are needed (Liu et al. 2017). Hence, Liu and colleagues (2017) have proposed a multilevel model of risk for mortality and a comprehensive framework to guide the development and implementation of likely effective interventions to reduce excess mortality in people with SMD and a set of priorities for clinical practice. We begin our overview by presenting key recommendations from Liu and colleagues (2017), which are in line with the vision statement of the World Health Organization's Comprehensive Mental Health Action Plan 2013–2020 (WHO 2013). This vision statement underscores the importance of people with mental disorders receiving the full range of human rights and access to high-quality, culturally appropriate health and social care in a timely way to enhance recovery. After providing this important overarching context, we then focus on the importance of lifestyle behaviors and behavioral interventions to reduce CVD among people with SMD. **Table 1** summarizes key recommendations from the papers reviewed regarding behavioral interventions to reduce CVD risk among people with SMD.

## **MULTILEVEL MODEL OF RISK AND MULTILEVEL INTERVENTION FRAMEWORK TO REDUCE EXCESS MORTALITY**

Liu et al.'s (2017) multilevel model of risk for excess mortality in SMD highlights risk factors at the individual, health system, and socio-environmental levels. They point out that risk factors at the individual level can be disorder specific (severity, family history, symptoms, age of onset, recency of diagnosis) and/or behavior specific [e.g., tobacco use, poor diet, inadequate physical activity, alcohol and other drug (AOD) use, low motivation affecting treatment seeking and medication adherence]. Further, they outline how health system factors can also be risk factors for mortality, including leadership (absence of relevant policies and guidelines), financing (low investment in quality care), information (limited health information systems), service delivery (verticalization and fragmentation of health services, lack of care coordination and management, limited access to services), human resources (poor-quality service provision, negative beliefs/attitudes of workforce, poor communication), and medications (lack of or excess dosing with antipsychotic medications, polypharmacy). Liu et al. (2017) maintain that people with SMD receive poor-quality physical health care, from health promotion and disease prevention to intervention. Social determinants of health enumerated by Liu et al. (2017) include public policies (discriminating policies, low financial protection and limited coverage in health packages), socioeconomic position (unemployment, homelessness, low health literacy), culture and social values (stigma and discrimination in society, negative stereotypes about people with SMD), environmental vulnerabilities (infections, malnutrition, impoverished or unsafe neighborhoods), and social supports (limited family, social, and community resources). Liu et al. (2017) emphasize that these risk factors are intertwined in ways that likely contribute to excess mortality. They note, for example, that although a large majority of people with SMD die of CVD, only 25% receive CVD diagnoses and that if a diagnosis is received, the risk due to ischemic heart disease approximates that of the general population. In a recent review by cardiologists (Nielsen et al. 2021), negative attitudes toward people with SMD

were noted among clinicians working outside mental health, and these negative attitudes affected rates of diagnosis and treatment. Nielsen et al. (2021) suggest that education of staff may help reduce these negative attitudes.

Liu et al. (2017) recommend comprehensively targeting the individual, health system, and socio-environmental determinants of health described above. However, they point out that

**Table 1 Conducting behavioral interventions to reduce CVD risk among people with SMD: key points**

<b>Early intervention</b>	
<ul style="list-style-type: none"> <li>■ Provide evidence-based interventions from the start of mental health treatment to prevent onset of moderate to severe CVD risk behaviors and their sequelae.</li> <li>■ Encourage nonsmokers not to take up smoking. For those who already smoke, from the start of mental health treatment, offer interventions combining psychological strategies and pharmacotherapy for smoking while also addressing additional CVD risk behaviors.</li> </ul>	
<b>Sharing of information about the influence of CVD risk behaviors on mental health</b>	
<ul style="list-style-type: none"> <li>■ Targeting health behaviors when the presentation is for a mental health problem may be assisted by sharing information with clients on how changing CVD risk behaviors can improve mental health.</li> </ul>	
<b>Combining elements of effective behavioral interventions to reduce CVD risk</b>	
<ul style="list-style-type: none"> <li>■ At a minimum, the same guidelines for physical health care that are intended for the general population can be offered.</li> <li>■ Motivational interviewing, CBT, mindfulness, and family interventions are worthy of consideration for multiple risk behavior change.</li> <li>■ Personalize and tailor regimens (including motivational and cognitive challenges and social and environmental supports).</li> <li>■ Work in a multidisciplinary team (including dietitians and qualified exercise professionals).</li> <li>■ Provide options for service delivery: in person or by telehealth and/or digital.</li> <li>■ Ensure that interventions are of sufficient duration and intensity.</li> </ul>	
<b>Weight</b>	<b>AOD use</b>
<ul style="list-style-type: none"> <li>■ Focus should be given to cardiometabolic protection in at-risk people (e.g., adapt principles and strategies of the Diabetes Prevention Program).</li> </ul>	<ul style="list-style-type: none"> <li>■ Conduct comprehensive assessments that encompass the wide range of lifestyle factors associated with AOD problems and SMD.</li> </ul>
<b>Smoking</b>	
<ul style="list-style-type: none"> <li>■ Tobacco smoking should be raised with everyone (e.g., every 6 months), including checking on smoking status (in case of smoking uptake) and congratulating clients for not smoking.</li> <li>■ Behavioral interventions combined with pharmacological interventions are more effective than either alone.</li> <li>■ Behavioral interventions can be provided by quitlines.</li> <li>■ Harm reduction strategies such as e-cigarettes should be considered in those who cannot or do not want to quit.</li> </ul>	<ul style="list-style-type: none"> <li>■ Offer evidence-based AOD intervention at first episode and at all stages of SMD. Maximize opportunistic service contacts (e.g., hospitalization) as potential for intervention.</li> <li>■ No one specific evidence-based intervention is recommended. Functional recovery is supported with general principles including increasing motivation and sustaining service engagement, reduction of AOD-related harm, behavior change, and relapse prevention.</li> <li>■ Interventions should consider possible cognitive difficulties and modify therapeutic content and delivery as appropriate.</li> </ul>
<b>Social isolation</b>	
<ul style="list-style-type: none"> <li>■ Supported social engagement is beneficial, and extended duration of support is not necessarily of increased benefit.</li> <li>■ The benefit of supported social participation can extend for up to 2 years.</li> </ul>	<ul style="list-style-type: none"> <li>■ Consider and engage the whole system (a multiagency approach is encouraged); involve consumers in development of services and support plans; and provide instrumental and emotional support for carers and family.</li> </ul>
<b>Poor medication adherence</b>	
<ul style="list-style-type: none"> <li>■ Interventions to improve medication adherence in people with SMD are heterogeneous and inconsistent regarding their effect.</li> <li>■ Interventions involving family members or technology, such as text messages or e-monitoring, may improve medication adherence.</li> </ul>	<ul style="list-style-type: none"> <li>■ Decrease stigmatization of both AOD use and SMD through skills training and support for service staff.</li> </ul>
	<b>Sleep</b>
	<ul style="list-style-type: none"> <li>■ CBTi for sleep problems can be adapted for people with SMD.</li> </ul>

(Continued)

**Table 1** (*Continued*)

Settings
<ul style="list-style-type: none"> <li>■ Telehealth is feasible and acceptable.</li> <li>■ Include primary and secondary settings with dedicated physical health staff delivering sessions if possible.</li> <li>■ The primary care setting is likely best placed to deliver a modified Diabetes Prevention Program.</li> <li>■ Psychologists working alongside medical staff in primary care are well placed to provide staff training and supervision and to provide more intensive interventions to those who need them.</li> <li>■ Interventions may need to be tailored for young people, Indigenous people, and people from low social economic backgrounds as well as for gender.</li> <li>■ Coordination of care in the first year after hospitalization is important to ensure preventive services and monitoring of medication side effects.</li> </ul>

Abbreviations: AOD, alcohol and other drug; CBT, cognitive behavioral therapy; CBTi, CBT for insomnia; CVD, cardiovascular disease; SMD, severe mental disorder.

effective and scalable combinations of these interventions have yet to be fully evaluated. Overall, they argue that the implementation and impact of individual focused interventions are likely affected by the larger health care system. Thus, the present review's focus on individual behavioral interventions is by its very nature limited. However, clinicians who are aware of the context within which behavioral interventions occur can more easily work to address health system and social factors in the course of their work, depending on the resources available to them.

## BEHAVIORAL RISK FACTORS FOR CARDIOVASCULAR DISEASE

The combination of four health risk behaviors (smoking, physical inactivity, excessive alcohol consumption, and low fruit and vegetable intake) predicts a fourfold difference in total mortality in men and women, largely due to cardiovascular causes, with an estimated impact equivalent to 14 years in chronological age (Khaw et al. 2008). Recently, a large Norwegian study (Krokstad et al. 2017) has shown that in addition to these four risk behaviors, inadequate sleep and poor social participation add to risk of death. These six health risk behaviors are highly prevalent among people with SMD, as described below.

### Smoking

According to the 2010 Survey of High Impact Psychosis, approximately 68% of people with SMD in Australia (61% bipolar disorder; 70% schizophrenia) are current smokers (Cooper et al. 2012) compared to 11% in the general population (Aust. Inst. Health Welf. 2021, Cooper et al. 2012). This exceeds the prevalence in both the United States [46.4% bipolar disorder; 59.1% schizophrenia (McClave et al. 2010)] and the United Kingdom [20% bipolar disorder; 37% schizophrenia (Hippisley-Cox et al. 2007)]. However, despite the more promising prevalence in the United States and the United Kingdom, the disparity between people with SMD and the general population [18% in the United States (McClave et al. 2010); 13% in the United Kingdom (Hippisley-Cox et al. 2007)] remains significant.

### Excessive Alcohol Consumption

People with SMD consume alcohol more excessively than the general population. The most recent data in Australia come from the 2010 Survey of High Impact Psychosis, in which 12.5% of people with SMD reported daily or almost daily alcohol use in the previous year compared to 7.4% in the general population in the same year (Aust. Inst. Health Welf. 2020, Moore et al. 2012). According to a systematic review of alcohol use disorders (AUDs) in people

with schizophrenia, 24.5% have had a lifetime diagnosis of AUDs (Koskinen et al. 2009); a similar review reports a prevalence of 35% in people with bipolar disorder (Di Florio et al. 2014).

### **Physical Inactivity**

People with SMD are less physically active, spending more time sedentary and less time participating in moderate or vigorous physical activity, than the general population (Vancampfort et al. 2017). A 2016 review found that people with psychosis spent close to 3 h (167.9 min) more than healthy controls engaging in sedentary behavior (Stubbs et al. 2016).

### **Low Fruit and Vegetable Intake**

People with SMD have poor fruit and vegetable intake. The Australian Dietary Guidelines recommend five servings of vegetables and two servings of fruit per day to promote optimal health (Natl. Health Med. Res. Council 2013). The Australian National Survey of Psychosis found that 6.8% of people with psychosis consume an adequate amount of fruits and vegetables (Foley et al. 2014). While this seems extremely low, the Australian Bureau of Statistics reports that only 5.4% of Australians meet the national guidelines in the general population (Aust. Bureau Stat. 2018), suggesting that fruit and vegetable intake in Australia is poor across the board. However, among those who do not meet the guidelines, an alarming 8% of people with SMD do not eat any vegetables at all and 25% do not eat any fruit, compared to only 0.8% and 5.2% of the general population (Aust. Bureau Stat. 2018, Hahn et al. 2014).

### **Inadequate Sleep**

People with SMD experience poorer sleep than the general population. They take longer to fall asleep, have poorer-quality and shorter sleep, and wake more during the night (Baglioni et al. 2016, Ng et al. 2015).

### **Poor Social Participation**

People with SMD are less likely to participate in social and community activities than the general population. The rate of employment is only 32.7% among people with SMD compared to 62.5% in the general population (Stain et al. 2012). People with SMD are also far more likely to live alone (31.7%) compared to the general population (10%) (Aust. Bureau Stat. 2019, Stain et al. 2012). The 2010 Survey of High Impact Psychosis indicates that 82.8% of people with SMD avoid social interactions because of anxiety, and 80.1% perceive themselves as lonely (Aust. Bureau Stat. 2021).

### **Poor Medication Adherence**

In addition to the above six health risk behaviors, other health risk factors, such as obesity, hyperlipidemia, hypertension, and diabetes, are also highly prevalent among people with SMD. People treated with antipsychotic drugs show weight gain and higher rates of hyperglycemia and hyperlipidemia than those receiving placebo, and metabolic adverse effects have been observed with mood stabilizers and antidepressants in bipolar disorder (Nielsen et al. 2021). Medication adherence is important in the management of these medical conditions, and adherence to antipsychotic and other medications can be challenging in light of these side effects. Thus, we focus on review papers concerning seven cardiovascular risk behaviors, including medication adherence, in the present review.

As far as we are aware, no other papers have reviewed the effectiveness of behavioral interventions for all seven risk behaviors among people with SMD. Thus, papers reviewed below focus on various subsets or combinations of CVD risk behaviors.

## **CARDIOVASCULAR RISK BEHAVIORS AFFECT MENTAL HEALTH**

While we intend to focus on behaviors that influence cardiovascular health, people with SMD will be interested to know, and potentially motivated by, findings showing that CVD risk behaviors also influence mental health. A recent systematic meta-review aimed to establish the current evidence on causal relations between key modifiable health behaviors and the incidence and outcomes of mental disorders, including bipolar disorder, schizophrenia, and related psychotic disorders. Firth et al. (2020) examined how physical activity (11 studies), sleep (10 studies), dietary patterns (12 studies), and tobacco smoking (15 studies) affect the risk and treatment outcomes of mental disorders (Firth et al. 2020). Their results synthesize the findings of 29 meta-analyses of prospective/cohort studies, 12 Mendelian randomization studies, two meta-reviews, and two meta-analyses of randomized controlled trials (RCTs). Potentially shared neurobiological pathways between multiple lifestyle factors and mental health were identified. There was convergent evidence for the use of physical activity in primary prevention and clinical treatment across a spectrum of disorders, including SMD. Emerging evidence was found for tobacco smoking as a causal factor in the onset of major depression, bipolar disorder, and schizophrenia. A complex bidirectional relationship was identified between sleep and mental illness, and sleep disturbances significantly heightened the risk of suicidal behavior in people living with mental illness. More research is required to more clearly identify the relationship between dietary patterns and risk of mental illness. Further research is also suggested to explore the neurobiological pathways through which various lifestyle factors affect mental health, as such evidence is currently sparse. Potential promising lines of research include investigating possible direct mechanisms, such as inflammatory processes and the gut biome, and also downstream consequences of unhealthy behaviors, such as obesity, which may affect mental health.

## **AIM**

The aim of the present review is to survey the evidence for behavioral interventions addressing smoking, excessive alcohol consumption, poor diet, physical inactivity, inadequate sleep, poor social participation, and poor medication adherence among people with SMD. We outline recent meta-reviews of the literature and then review additional key studies to provide clinical recommendations for behavioral interventions to reduce CVD risk among people with SMD.

## **EARLY INTERVENTION**

There is increasing evidence that improving access to screening and monitoring of CVD conditions among people with SMD may not positively affect health outcomes such as diabetes management, weight control, and smoking cessation (Murphy et al. 2018). In the *Lancet Psychiatry* Commission's "Blueprint for Protecting Physical Health in People with Mental Illness" paper, Firth and colleagues (2019) argue that given the high likelihood of physical health deterioration while taking second-generation antipsychotics, clients (including those with intact metabolic health) should be given access to evidence-based interventions from the start of treatment with antipsychotics. They recommend intervening on the basis of risk, rather than waiting for visible weight gain, metabolic dysfunction, or other problems to occur, and simultaneously considering multiple lifestyle factors to manage risk behaviors and factors across mental health diagnoses



(Firth et al. 2019). A comprehensive lifestyle assessment is suggested to give clients more actionable physical health information than screening because it includes specific lifestyle changes clients could make to protect their physical health. As described below, this may best take place within a multidisciplinary team approach.

Firth et al. (2019) point out that although transdiagnostic, multifactorial approaches are not yet widely reflected in the published literature, motivational interviewing, cognitive behavioral therapy (CBT), and family interventions have been shown to be effective. Readiness to change, cognitive ability, and cognitive distortion associated with mental disorders need to be considered in tailoring interventions, which should be accompanied by clear referral policies where needed (Firth et al. 2019).

## **TOWARD A TRANSDIAGNOSTIC APPROACH**

At least five of the aforementioned seven CVD behaviors—smoking, physical inactivity, excessive AOD consumption, low fruit and vegetable intake, and poor medication adherence—can be conceptualized within the framework of a dual-process theory of human behavior (Heather 2017) and experience. Arguably, certain behaviors associated with poor social participation (e.g., avoidance) and inadequate sleep (e.g., consistent late rising) can also be brought within this framework. As Heather (2017) explains, dual-process theories propose that behavior can be the result of one of two different kinds of information processing and of their interaction. These are implicit, automatic, and mainly nonconscious processes and explicit, controlled, and mainly conscious processes. Heather (2017) notes that the practical application of the theory is to improve people's control over their behavior. This might be achieved through motivational interviewing and, where necessary, CBT strategies and practice in how desire can be resisted and self-control over unwanted behavior can be sustained. Heather (2017) sees the model as applying to a stepped care approach with brief interventions among people with lower levels of problematic behaviors and to formal treatment with moderate to severe behavioral problems. In addition to systematic training in self-control techniques, Heather (2017) suggests that mindfulness training may assist in establishing greater cognitive control over impulsive urges and preventing relapse. From a clinical perspective, a dual-process model can assist in case conceptualization following assessment, helping the client understand temptations to engage in multiple CVD risk behaviors and addressing multiple behaviors simultaneously.

## **OVERVIEW OF KEY REVIEWS OF BEHAVIORAL INTERVENTIONS TO REDUCE CARDIOVASCULAR DISEASE RISK**

### **Interventions Focusing on Single or Multiple Components of Weight Management**

Ward et al. (2015) conducted a meta-review of lifestyle interventions for CVD risk factors in the general medical population ( $n = 102$  reviews) and in people diagnosed with SMD (schizophrenia and other psychotic disorders, bipolar disorder, or major depression with psychotic features;  $n = 21$  reviews). A total of 64 were systematic reviews, including meta-analyses, and 69 were narrative reviews (due to a large overlap of information, not every selected review was described in their article). Interventions targeted obesity, diabetes, dyslipidemia, and/or hypertension. They included dietary modification, increase in physical activity, and CBT. The authors classified the strength of the evidence broadly; systematic reviews (with or without meta-analyses) were considered the most rigorous (level 1). Nonsystematic reviews, including narrative reviews, were regarded as suitable for developing promising recommendations (level 2). They found that several



factors were associated with better outcomes in the general population. Specific elements of diet (three level 1 elements, five level 2 elements), exercise (two level 1 elements, one level 2 element), and CBT were shown to be superior. Increasing the number of CBT strategies improved results (one level 2 element), including goal setting, self-monitoring of food intake and physical activity, use of structured curricula, and a focus on improving self-efficacy. Successful programs employed multiple components (dietary modification, exercise, and CBT) rather than just one of these components (level 1 evidence). Personalization of diet and exercise regimens was found to increase participation and improve outcomes (level 1 evidence). Higher intensity (level 2 evidence) and longer duration of treatment (level 2 evidence), with an active phase of 4 to 6 months, also improved outcomes. Multidisciplinary teams, including professionals and peer community providers, also appeared to improve outcomes (level 2 evidence). Training of program leaders increased effect size (level 2 evidence). Face-to-face interventions were more efficacious than virtual meetings (level 1 evidence). However, our more recent systematic review of interventions among people with SMD delivered partially or solely by telephone found telephone delivery to be at least equivalent if not superior for relapse prevention, medication adherence, and smoking and other CVD risk behaviors (Baker et al. 2018b). Furthermore, a narrative review (Talley et al. 2021) of the rapid regulatory and practice shifts that facilitated broad use of telemedicine during the coronavirus disease 2019 (COVID-19) pandemic concluded that telemedicine can be used to complement in-person care and extend service delivery, maximizing access, efficacy, and appeal of services for people with SMD.

### **Interventions Focusing on Weight Management Among People with Severe Mental Disorder Need to Be Tailored**

Ward et al. (2015) argue that the use of multiple key elements in interventions among individuals with SMD is likely to be associated with success in reducing CVD risk. However, they note that these key elements have not consistently been included in lifestyle interventions among people with SMD. Although their review of interventions in individuals with SMD showed that, as in the general population, single-component programs were less effective than those employing multiple components (exercise, diet, and CBT), few interventions in SMD employed multiple components. They note that manualized interventions (structured curricula) have rarely been employed. Furthermore, group interventions, although cost-effective and beneficial for decreasing social isolation in SMD, may not provide sufficient tailoring. In addition, Ward et al. (2015) note that interventions for people with SMD are often of shorter duration and lower intensity than is recommended for the general population. Also, lifestyle interventions in SMD are more often employed by individual treatment providers without specific training than by interdisciplinary teams. Reasons for not incorporating these key elements include negative symptoms, medication side effects, and chaotic lifestyles and hospitalizations, making high intensity and frequent clinic visits unlikely, with low-intensity programs aiming for better patient adherence. Additionally, low socioeconomic status may impede adherence to specific diets. Quality training and provision of multiple providers to participate in multidisciplinary teams are likely limited by a paucity of available resources in community mental health settings. Ward et al. (2015) conclude that addressing the unique needs of people with SMD is an important step in developing new programs. They suggest that intensive and multifactorial programs may be necessary to combat symptoms of mental illness and provide creative solutions to socioeconomic limitations. Ward et al.'s (2015) paper is important because it highlights findings from the general medical population that could be extrapolated to people with SMD. However, although their recommendations seem clinically plausible, many are based on level 2 evidence.

A more recent systematic review with a meta-analysis of 41 RCTs assessed the effect of lifestyle interventions for weight management among people with SMD (diagnosis of major depressive disorder, schizophrenia, schizoaffective disorder, or bipolar disorder) (Speyer et al. 2019). In total, 4,267 people over 18 years of age were enrolled in the RCTs. Almost three-quarters of the sample (73%) had been diagnosed with schizophrenia spectrum disorders. Speyer et al. (2019) examined primary outcomes of weight, body mass index (BMI), and the proportion achieving clinically relevant weight loss (at least 5%). Secondary outcomes were quality of life, cardiometabolic risk factors, and adverse effects. Treatment duration ranged from 8 to 52 weeks (mean = 22 weeks). The number of intervention sessions ranged from 5 to 104 (mean = 26). The follow-up duration after cessation of intervention ranged from 8 to 84 weeks (mean = 31). Over two-thirds of trials were at high risk of bias. Compared with the control group, lifestyle interventions were associated with a statistically significant short-term effect on weight (−2.2 kg; 32 trials) and waist circumference (−2.1 cm; 23 trials). Lifestyle intervention decreased the mean difference in BMI by 0.63 kg/m<sup>2</sup> in the intervention groups compared to controls at maintenance (17 trials; not significant). In the intervention group, significantly more people (27.5% versus 18.1% in the control group) lost ≥5% of body weight. Quality of life did not differ between groups (15 trials). There were no significant differences in number of somatic or psychiatric hospitalizations or deaths between conditions (6 trials).

Overall, Speyer and colleagues (2019) found little support for implementing individualized lifestyle interventions to counteract weight gain in SMD, at least in samples consisting predominantly of people diagnosed with schizophrenia. Effects were considered too small to be clinically relevant. They do, however, point out that large variations in response suggest that subgroups might benefit. They note that the generalizability of their findings is limited because people with severe symptoms of SMD, substance use disorders, or comorbid medical disorders were often excluded from studies. Furthermore, they point out that financial resources and human engagement available in clinical trials will often exceed that available in real-world settings, rendering such interventions unaffordable.

Speyer and colleagues (2019) suggest that further research could evaluate interventions designed to affect other causes of unhealthy lifestyle, such as loneliness and low socioeconomic status, or structural interventions facilitating healthy food and attractive possibilities for physical activity. Further, they recommend that tighter regulation of the food and tobacco industries might help protect people with SMD from CVD.

## **LIFESTYLE INTERVENTIONS FOCUSING ON EXERCISE, SMOKING, DIET, OR SLEEP AND TREATMENT OF MENTAL DISORDERS**

In Firth and colleagues' (2020) aforementioned overview of lifestyle factors involved in the prevention of mental disorders, the authors analyze results from two meta-reviews and two meta-analyses of RCTs, synthesizing the evidence for targeting specific lifestyle factors in the treatment of various mental disorders, including SMD. In people with schizophrenia or nonaffective psychotic disorders, physical activity interventions across eight RCTs did not significantly reduce total symptoms. However, RCTs of exercise interventions that used at least 90 min of moderate to vigorous activity per week did significantly reduce total symptoms, positive symptoms, and negative symptoms compared to control conditions. Exercise was also found to improve global cognition in schizophrenia. The effects of exercise in bipolar disorder were not investigated in any meta-analyses of RCTs. Firth et al. (2020) suggest that for the treatment of diagnosed mental illness, supervised exercise interventions should be made available that incorporate moderate to vigorous activity and are delivered by trained exercise professionals either working

within mental health services or through referral to community-based schemes. They also note that there is now some evidence that muscular strength and resistance training can significantly improve mental health with effects that may persist over and above those of aerobic exercise alone. Hence, they suggest that further research and guidelines on physical activity consider the efficacy and feasibility of resistance training interventions in the treatment of mental illness.

The impact of nonpharmacological smoking interventions on psychiatric symptoms in populations with mental disorders was not found in any eligible meta-analyses of RCTs (Firth et al. 2020). According to Firth et al. (2020), a consistent body of evidence shows that quitting smoking does not cause deterioration in mental health among those with mental disorders and appears to improve psychological well-being. They suggest that as smoking is a leading cause of the 15- to 30-year mortality gap among people with SMD, there is a critical need for smoking interventions in mental health care settings. They also suggest that given the role of tobacco use as a cause of psychiatric disorders and a major source of health inequalities, further research into the potential benefits of harm reduction strategies such as e-cigarettes should be conducted.

There were no eligible meta-analyses of dietary interventions in the treatment of mental disorders other than attention-deficit/hyperactivity disorder (Firth et al. 2020). Although further evidence is needed to establish how nutrition affects mental health, Firth et al. (2020) state that several recent RCTs not covered in their meta-review have reported improvements in clinical depression from Mediterranean diet interventions. Given the high levels of dietary risk factors and associated cardiometabolic diseases associated with mental illness, Firth et al. (2020) suggest there is already a basis for considering dietary factors within multidisciplinary health care for people with mental illness.

Evidence from a pooled analysis of seven RCTs across a mixed psychiatric sample with anxiety, depression, or posttraumatic stress disorder showed that CBT-based sleep interventions produced large and significant reductions in depressive symptoms in comparison to control conditions. Firth et al. (2020) also cite recent evidence that CBT for insomnia (CBTi) significantly reduces the severity of hallucinations and paranoia in young people experiencing symptoms of psychosis. They suggest that establishing the feasibility and effectiveness of CBTi among people with SMD is a priority for future research.

Firth et al. (2020) recommend that lifestyle interventions should be provided in primary and secondary settings for people with mental disorders. These should capture the broad principles of evidence-based lifestyle interventions for mental disorders: using behavior change techniques with specific, measurable behavioral goals and self-monitoring; having dedicated physical health staff deliver sessions for service users; training mental health staff in the importance of and goals for healthy lifestyle interventions; and facilitating peer support to improve uptake and adherence. They suggest that further research should address existing barriers toward implementation and dissemination of lifestyle interventions, including digital technologies.

## **MULTIDISCIPLINARY APPROACHES TO MULTIPLE CARDIOVASCULAR DISEASE RISK BEHAVIORS**

Incorporating lessons learned from the multilevel risk for excess mortality and the comprehensive intervention framework described previously, Liu et al. (2017) prioritize the following key action points for clinical practice. They state that at the very least, the same guidelines for physical health care that are intended for the general population can be offered to people with SMD. Coordination of outpatient support in the first year after discharge from psychiatric hospitalization is important, and communication is necessary between mental and physical health care providers to ensure preventive services and monitoring of antipsychotic side effects. Tobacco cessation

should be raised with every person with SMD. Behavioral interventions need to be tailored to account for motivational and cognitive challenges and should include social support strategies and environmental supports.

In the *Lancet Psychiatry* Commission's blueprint paper, Firth and colleagues (2019) propose that the first step to reduce physical health disparities for people with mental illness comprises the adoption, translation, and routine provision of evidence-based lifestyle interventions as a standard component of mental health care. However, key considerations for the content and timing of interventions in SMD need to be made. As stated above, Firth and colleagues (2019) recommend commencing early, focusing on cardiometabolic protection in at-risk people. They suggest that principles of the Diabetes Prevention Program (DPP Res. Group 2002) are likely useful among people with SMD, given its benefits among people at risk of developing diabetes. Principles include measurable and specific goals, case managers or lifestyle coaches, frequent contact and ongoing intervention, a toolbox of adherence strategies, adaptation for cultural and ethnic groups, and local and national networks of training, feedback, and support. They note that as the Diabetes Prevention Program has been successfully delivered in primary care settings, it could be adapted for people with SMD and made available through primary care. They also note that for the program to be properly implemented, qualified exercise professionals and dietitians should deliver lifestyle interventions, sufficient access to supervised exercise services should be given, and existing mental health care staff should be familiar with the lifestyle interventions. Flexibility in delivery, a focus on practical exercise and dietary advice, and provision of support to integrate the lifestyle measures into daily life are highly recommended. Although the evidence is only preliminary among people with mental illness, digital technology, including texting, should be considered.

## **LARGE TRIALS ADDRESSING SMOKING AND OTHER CARDIOVASCULAR RISK BEHAVIORS OR FACTORS**

The evidence presented above shows that multicomponent interventions focused on weight loss among people with SMD have reported small effects overall. Further, the *Lancet Psychiatry* Commission (Firth et al. 2019) has suggested that focus be given to prevention and early intervention before cardiometabolic problems develop. Given this context, it is within the literature addressing smoking and other CVD risk behaviors or factors that the most promising results have been reported (Baker et al. 2011, 2015, 2018a; Dalcin et al. 2019; Daumit et al. 2020). As smoking rates are so high among people with SMD and smoking is known to be the main preventable cause of death in people living with psychotic disorders (Callaghan et al. 2014), interventions for smoking, possibly combined with those for other CVD risk behaviors or factors, have a potentially large impact. Below, we describe two large recent studies that addressed smoking and CVD risk behaviors among people with SMD.

Our group (in New South Wales and Victoria, Australia) conducted an RCT among 235 people with nonacute psychotic disorders (59% schizophrenia spectrum) who smoked at least 15 cigarettes per day (we also addressed other CVD risk behaviors) (Baker et al. 2011, 2015, 2018a). Consent was sought to liaise with treating health professionals regarding assessment results and treatment progress, management of any acute episodes, and follow-up arrangements. In this trial, all participants received a 90-min initial face-to-face intervention session, after which they received up to 24 weeks' supply of nicotine replacement therapy (NRT) delivered at weeks 1, 4, and 8, and thereafter by arrangement. The initial session focused on providing feedback regarding smoking (e.g., level of dependence) and other CVD risk factors, and a case formulation was developed with the participant regarding CVD risk status and unhealthy behaviors. Participants were randomized to receive combination NRT plus either 16 additional 1-h motivational interviewing and CBT

face-to-face sessions or 16 mostly telephone-delivered brief sessions over 9 months. Interventions were delivered by psychologists. The face-to-face manual-guided intervention focused on smoking and the particular CVD risk behaviors(s) considered most problematic by the participant. In the face-to-face intervention, contingent reinforcement (vouchers and cash) was provided based on expired carbon monoxide readings. If not already a focus, physical activity components were commenced in session 4 and dietary components in session 7. The telephone-delivered interventions were designed to control for administration of NRT, number of and interval between counseling sessions, and monitoring of nicotine withdrawal, medication side effects, distress, smoking, diet, and physical activity. The monitoring form focusing on nicotine withdrawal, medication side effects, distress, and smoking has been published (Segan et al. 2017). The intervention manuals are available from the chief author (Baker), and subsequent adaptations of the manual and videos are freely available at <https://healthyrecovery.home.blog>. Telephone sessions were scheduled to last approximately 10 min, and at weeks 4 and 8 participants attended 30-min face-to-face sessions in which NRT was dispensed and biomedical results were taken. Following baseline, blind follow-up assessments were conducted at 15 weeks (midintervention) and at 12, 18, 24, 30, and 36 months. We predicted that the face-to-face intervention would be associated with greater improvements on two primary outcome variables: CVD risk and smoking status. Secondary dependent variables included weight, physical activity, unhealthy eating, substance use, psychiatric symptomatology, treatment retention, and global functioning.

Contrary to our prediction, there were significant reductions in CVD risk and smoking in both conditions and no differences between conditions at 15 weeks and 12 months. There were no significant improvements in health behaviors other than smoking during the first 12 months. However, there were significant improvements in depression and global functioning across the sample as a whole. For those who attended at least one session, there was a significant overall difference in session attendance between the face-to-face (mean 9.2 sessions) versus telephone (mean 12 sessions) conditions.

Over 36 months, there were reductions in CVD risk in both conditions and reductions in daily cigarette consumption at almost all time points in both conditions. Seven-day biochemically verified point prevalence abstinence ranged from 6.2% to 12%, and the number of participants who had a 50% or greater reduction in cigarettes smoked per day at each time point ranged from 16% to 42% (midintervention). There were no significant differences between conditions on these measures. Apart from smoking, there were no statistically significant improvements relative to baseline on any other health behaviors, nor were there any significant differences between conditions on these measures. However, total cholesterol, which contributes to CVD risk scores, was significantly lower in the face-to-face condition at one time point (30 months) and in the telephone condition at two time points (18 and 24 months). CVD risk scores fell by 13.6% in the face-to-face condition at 18 months and by 27.5% in the telephone condition and were not significantly different. In terms of minimal clinically important differences (at least a 50% decrease in smoking and at least a 25% improvement on health behaviors and factors), the majority of participants (63%) experienced clinical improvement (on any of the measures) at multiple follow-up phases. Both conditions exhibited improvements in mental health and functioning. Participants experiencing worse social discomfort at baseline (anxiety, mania, poor self-esteem, and social disability) had on average significantly worse global functioning, lower physical health scores, and significantly greater waist circumference.

These results show that a largely telephone-delivered smoking cessation intervention, accompanied by combination NRT, resulted in excellent retention among people with SMD and could significantly reduce smoking and CVD risk scores, comparable to a face-to-face intervention. Based on these results, we engaged with Quitline (Victoria, Australia) in a subsequent study

focused on smoking cessation (Baker et al. 2019). Interestingly, our study showed that discomfort in social situations, likely related to social isolation—itself a risk factor for CVD—was related to lower physical health scores, suggesting that further intervention research in this domain should report on CVD risk outcomes.

A strength of the above study is that it had broad inclusion criteria and did not exclude people with substance use disorders other than tobacco, unlike many studies among people with SMD. Limitations include the use of an age-related CVD risk score and longer-term follow-up rates of around 60%, although intention-to-treat analyses were conducted. The findings that smoking status improved, CVD risk scores were reduced, mental health improved, and clinical improvement occurred at multiple time points for almost two-thirds of the sample suggest that smoking-focused healthy lifestyle interventions delivered in person or via telephone (or a combination of both) are worthy of further research. In follow-up research (Baker et al. 2014), we conducted a small pilot trial to investigate whether people with schizophrenia would engage in an entirely telephone-delivered healthy lifestyle assessment and intervention. Feasibility and acceptability were confirmed and results were encouraging, suggesting that face-to-face interventions may not be necessary for healthy lifestyle interventions, at least among people who are already engaged in treatment for SMD.

Another recent RCT also reported significant reduction in CVD risk among people with SMD (59% schizophrenia spectrum)—a reduction primarily attributable to smoking cessation (Daumit et al. 2020). In this trial, 264 clients of four community mental health outpatient programs in Maryland (United States) were recruited into the study if they had at least one CVD risk factor. Those with an active AUD or substance use disorder were excluded. Tailored motivational interviewing and solution-focused therapy regarding CVD risk reduction was delivered by health coaches and a nurse at the community health center in collaboration with physicians, mental health staff, and caregivers. Sessions were 20–30 min long and held weekly for 6 months and then every 2 weeks thereafter for 18 months. Health coaches interacted regularly with the nurse to collaborate on optimal care for each participant's CVD factors. The nurse met with participants who required CVD risk factor education and medication-related counseling. The nurse also joined participants as needed on physician visits or communicated with the psychiatrist or physician about prescribing smoking cessation medication (varenicline or bupropion and/or combination NRT). CVD risk behaviors were targeted simultaneously or sequentially. A point system rewarded session attendance and incentivized behavior change, such as reductions in carbon monoxide, and were exchanged for small reward items. Each community health organization was provided with resources and training to deliver group physical activity classes for all program (intervention and control) attendees. A study dietitian also consulted with program kitchen staff. The control condition participants did not receive an individual intervention.

The primary outcome was percentage change in the risk of a cardiovascular event as assessed by global Framingham Risk Score from baseline to 18 months. Other study outcomes included change in the risk score at 6 months and individual modifiable score components at 6 and 18 months (systolic blood pressure, total cholesterol, high-density lipoprotein, diabetes status, and tobacco smoking status) as well as diastolic blood pressure, fasting blood glucose, glycated hemoglobin A<sub>1c</sub>, low-density lipoprotein, triglycerides, and BMI. More than 85% had two or more risk factors for CVD; 51.3% reported smoking tobacco at baseline. There was a significantly greater relative reduction in risk score within the intervention condition (11.2%) versus a 1.4% increase from baseline in controls, representing a net percentage risk reduction of 12.7% in 10-year global Framingham Risk Score for the intervention group compared to the control group at 18 months. There was a significantly greater reduction in biochemically verified smoking rates among the intervention condition, with an absolute change in prevalence at 18 months in the

intervention group relative to baseline of  $-11.81\%$  compared with  $-1.32\%$  in the control group (a  $-10.50\%$  change in prevalence). Smoking cessation was a major contributor to risk reduction at 18 months, with changes in blood pressure and lipids also affecting overall risk reduction. The median number of sessions attended over 18 months was 38. Participants attended a median of 3.5 sessions with a nurse, and for those requiring a nurse to accompany them to a physician appointment, the median number of sessions was 2.

Daumit et al. (2020) state that their findings show that a behavioral counseling, care coordination, and care management intervention conducted within routine outpatient specialty mental health care can significantly reduce overall CVD risk in adults with SMD. A strength of the study was its high follow-up rate ( $95.2\%$  at 18 months). Limitations include exclusion of those with substance use disorder (highly prevalent in SMD), and the authors note that a lack of formal relationship with primary care practitioners may have limited the prescription of medications.

Together, the results of these studies (Baker et al. 2018a, Daumit et al. 2020) provide exciting evidence that interventions combining psychological strategies and pharmacotherapy for smoking while also addressing additional CVD risk behaviors can significantly reduce CVD risk and smoking among samples of people with SMD, including when accompanied by substance use disorders. Interventions may be delivered either face-to-face or at least partially via telephone and are high intensity. The extent to which intensity can be varied or interventions delivered flexibly according to response would be interesting avenues of further research. Results suggest that people also improve on a variety of other CVD risk behaviors and factors. Our longer-term results over 36 months indicate that while people with SMD can sustain behavior change, there is substantial variability over time. The intervention conducted by Daumit and colleagues (2020) continued over 18 months, and it remains to be seen how well behavior change is sustained following the 18-month period. Given the positive results of combined face-to-face and telephone contact in our trial (Baker et al. 2018a), further studies involving a combination of modalities over extended periods of time would be informative. International collaboration employing guided face-to-face interventions and telemedicine and/or quitlines (plus smoking cessation pharmacotherapies) accompanied by contingent reinforcement may facilitate recruitment of larger samples with adequate power to detect changes in multiple health risk behaviors. We reported significant reductions in smoking and weight among smokers with SMD who were overweight in a pilot trial (Baker et al. 2009). Prevention of weight gain following smoking cessation among people with SMD would be worthy of further research.

Given that CVD risk behaviors will vary across individuals and that no study has yet evaluated a combination of risk reduction across all behaviors among people with SMD, it is worthwhile considering what behavioral interventions are effective for specific CVD risk behaviors in addition to smoking. In the following section, we outline this information.

## **BEHAVIORAL INTERVENTIONS FOR CARDIOVASCULAR DISEASE RISK BEHAVIORS OTHER THAN SMOKING**

### **Alcohol and/or Other Drugs**

High consumption of AODs has been linked to impaired functioning, decreased quality of life, medication noncompliance, increased hospital presentations, and longer inpatient admissions in people with SMD (Barrowclough et al. 2014, Jørgensen et al. 2018, Ouellet-Plamondon et al. 2017). Encouragingly, a meta-analysis that compared current and former substance users who had a psychotic illness found that those who reduced or ceased substance use experienced a positive impact on their mental health (Mullin et al. 2012). Both short- and longer-term reductions in substance use are considered achievable goals (Baker et al. 2012, Mullin et al. 2012).



The literature examining behavioral interventions for those with SMD and AOD use problems remains hindered by the frequent exclusion of these groups from RCTs and the heterogeneous nature of the intervention research (Boniface et al. 2018, Hunt et al. 2019, Liu et al. 2017).

Assessment and feedback alone have been shown to positively influence reduction of alcohol use in those with SMD (Baker et al. 2012). Assessment should be comprehensive and cover the range of physical, mental, and social factors associated with AOD problems and SMD (Morgan et al. 2017, Mueser & Gingerich 2013).

Evidence-based behavioral interventions include brief and extended motivational interviewing, CBT, skills training, and contingency management. Models of care include both integrated mental/physical health and AOD treatment (Hovhannisyan et al. 2020, Kikkert et al. 2018) as well as single-focus AOD treatments. Modes of delivery investigated include face-to-face and by telephone. While there is evidence to support specific interventions (Baker et al. 2012, Boniface et al. 2018, Destoop et al. 2021), none has consistently proved more effective than standard care for improving treatment retention, substance use, mortality, functioning, or perceived life satisfaction (Hunt et al. 2019).

Early intervention to reduce or cease AOD use (e.g., at first episode of psychosis) is likely to have increased benefits, although intervention is recommended at any stage of the SMD (Mullin et al. 2012). Fluctuating or limited motivation to change AOD use is notable in this population (Liu et al. 2017, NICE 2016), and in any intervention motivation is recommended as a focus. Specific health events such as hospital admissions may present an opportunity to capitalize on motivation for engagement in intervention (Graham et al. 2019).

The prevalence of impairment of cognition or executive function in people with SMD suggests that modification of content and delivery of existing therapy protocols may be required (Archibald et al. 2019, NICE 2016). Online and telephone therapy have been used to extend access to intervention in other socially disadvantaged populations. Those with SMD and AOD problems, particularly younger people, may find these methods acceptable and feasible (Thomas et al. 2017).

Stigma remains an issue for those experiencing AOD problems and SMD. For some, an identity based around AOD use is viewed as more normal and tolerable than one associated with SMD (Chorlton & Smith 2016). It is important to provide equity of access to services, ensure collaboration between agencies and supporting staff, and not perpetuate stigmatizing behaviors (NICE 2016). Supporting families and carers of those with SMD and problematic AOD use can, with education and both practical and emotional support, encourage sustained engagement with treatment services (Mueser & Gingerich 2013, Zabeen et al. 2020).

### **Poor Social Participation**

Social relationships and involvement in the community can have a far-reaching impact on an individual's well-being. For people with SMD, having poor social networks can negatively affect quality of life and recovery from psychosis (Albert et al. 2011, Harvey et al. 2007, Pitkänen et al. 2009). Additionally, social isolation has been identified as a risk factor for coronary heart disease and stroke (Valtorta et al. 2016).

The evidence for behavioral interventions targeting social isolation in people with SMD is limited. In a systematic review, Anderson and colleagues (2015) examined interventions that aimed to improve the social networks of people with SMD. The review was restricted to interventions that reported on behavioral outcomes, excluding those reporting only subjective outcomes (e.g., perceived satisfaction of social connections). Although the review included only five studies, four of the five reported significant increases in social networks (Castelein et al. 2008, Hasson-Ohayon et al. 2014, Terzian et al. 2013, Villalta-Gil et al. 2009). The interventions primarily involved prolonged support/facilitation from a dedicated person/group to participate in social activities

(Castelein et al. 2008, Sheridan et al. 2015, Terzian et al. 2013), one trialed a social cognition and interaction training intervention (Hasson-Ohayon et al. 2014), and one examined integrative psychological therapy assisted by a therapy dog (Villalta-Gil et al. 2009).

Three studies trialed support from a dedicated person or group to facilitate social activities from 6 to 9 months. The chosen facilitator varied between the studies. One study used staff at a community mental health service (for 6 months) (Terzian et al. 2013), another matched participants to volunteers (2 h/week for 9 months) (Sheridan et al. 2015), and the third trialed a guided peer support group (16 × 90-min sessions over 8 months) (Castelein et al. 2008). Two of the three interventions reported significant increases in social networks: the intervention facilitated by the community mental health staff (Terzian et al. 2013) and the guided peer support group (Castelein et al. 2008). The findings from Terzian and colleagues (2013) indicated long-term benefit with increased social networks at 2-year follow-up.

The study trialing a social cognition and interaction training intervention (Hasson-Ohayon et al. 2014) involved group cognition interaction training sessions and meetings with a social mentor three times per week. Duration of participation was unclear for this intervention. The authors reported a small but significant improvement in interpersonal communication.

The integrative psychological therapy, assisted by a therapy dog (Villalta-Gil et al. 2009), consisted of twenty-five 45-min sessions delivered twice per week. The therapy focused on both cognitive and social functioning and was modified to incorporate the dog in the exercises (e.g., for memory-focused intervention, short- and long-term recall of the dog's story replaced short- and long-term recall of a stimulus story). The authors reported a significant increase in social contact compared to the comparison group who received integrated psychological therapy in the absence of the therapy dog.

## Inadequate Sleep

Waite et al. 2020 systematically reviewed studies that investigated subjective sleep disruption and psychotic experiences (including correlational, treatment, and prevalence studies). Five studies evaluated psychological treatment in people diagnosed with nonaffective psychosis. Most studies ( $n = 4$ ) targeted insomnia, and one targeted nightmares. Three of the five studies evaluated CBTi interventions (two delivered individually and one in a group setting), one assessed a sleep treatment at acute crisis (STAC) intervention (which included CBTi, sleep monitoring, and light/dark exposure for circadian entrainment), and another evaluated imagery rehearsal training. The five studies are described below.

Freeman et al. (2015) conducted a pilot RCT of CBTi (eight individual manualized sessions across a 12-week treatment window) plus treatment as usual versus treatment as usual alone among 50 participants with persistent distressing delusions and/or hallucinations in the context of a diagnosis of nonaffective psychosis and insomnia. Treatment techniques included psychoeducation, assessment and goal setting, stimulus control, establishing daytime routine and circadian rhythm, sleep hygiene, relaxation, and cognitive therapy to address sleep-related beliefs. Although the study was insufficiently powered to detect treatment effects, there was a large effect size improvement in sleep posttreatment that was maintained at follow-up (24 weeks), as measured on the primary measure, the Insomnia Severity Index (Bastien et al. 2001).

In a 2018 open-label trial (Chiu et al. 2018), 74 patients with nonaffective psychosis who had insomnia symptoms and were attending outpatient clinics were assigned to either an adapted CBTi intervention added to usual care or to usual care alone. The intervention was delivered over four individual sessions (with a 6-week treatment window). There were significant overall effects showing the benefits of CBTi on multiple sleep domains. Latent class analysis revealed that the greatest treatment benefits were observed in those with classic severe insomnia.

Within a residential rehabilitation setting, Hwang et al. (2019) evaluated a four-session CBTi group intervention in addition to usual care (participants' original psychiatric drug therapy) compared to usual care alone in a nonrandomized trial with 63 patients. Significant improvements in sleep dysfunction were reported posttreatment and at follow-up.

A pilot trial (Sheaves et al. 2018) randomized 40 inpatients on an all-male acute psychiatric ward to receive STAC plus standard care or standard care alone. STAC included CBTi, sleep monitoring, and light/dark exposure for circadian entrainment, delivered over 2 weeks. Compared with standard care, STAC had a treatment benefit in the large effect size range at week 2 and at follow-up. However, the trial was not powered to assess the efficacy of the intervention.

Sheaves et al. (2019) conducted a pilot RCT ( $n = 24$ ) to evaluate imagery rehearsal training for reducing nightmare severity in patients with persecutory delusions. There was a treatment benefit for those in the intervention group on insomnia at 4 weeks posttreatment and at 8-week follow-up.

Together, these studies suggests that it is feasible to adapt CBTi for sleep problems in people with SMD. However, the relatively small sample sizes (24–74 participants) limit their ability to determine the effect of improving sleep.

## Medication Adherence

Among people with SMD, medication adherence is poor with both antipsychotic medication (Gianfrancesco et al. 2008, Moritz et al. 2009) and medications for comorbid CVD conditions (Dolder et al. 2003, Piette et al. 2007). In the most recent systematic review of medication adherence interventions for individuals with SMD, Hartung et al. (2017) examined interventions to improve psychopharmacological adherence as well as adherence to treatment plans for comorbid medical conditions in patients with psychotic spectrum disorders (20 studies) and bipolar disorder (4 studies).

With respect to psychotic spectrum disorders, two of three RCTs testing family interventions reported significantly improved medication adherence compared to usual care (Pitschel-Walz et al. 2006, Valencia et al. 2010). The third RCT (Kopelowicz et al. 2012) reported nonsignificant findings for a culturally modified version of multifamily group therapy. The strength of evidence was considered low. Therefore, there was only limited evidence suggesting greater medication adherence associated with family interventions.

Four RCTs (Beebe et al. 2014, Frangou et al. 2005, Montes et al. 2012, Velligan et al. 2012) that examined technology interventions yielded limited evidence of low strength to suggest associated improved medication adherence. Two RCTs found that electronic monitoring using smart pill containers/dispensers resulted in significantly better adherence versus either usual care (Velligan et al. 2012) or pill counts and self-reported adherence (Frangou et al. 2005). Two studies examined tele-interventions. The first (Beebe et al. 2014) compared telephone and SMS with telephone or SMS alone and found no difference between the technology interventions but significantly better adherence when comparing SMS with usual care. The latter was also the only study to evaluate adherence to nonpsychiatric medications (medications prescribed for physical illnesses, most commonly antihypertensives and calcium channel blockers) and found no differences in the comparison groups. The second study (Montes et al. 2012) found that an SMS-alone intervention led to significantly better adherence than usual care.

Of the 13 remaining studies, the strength of evidence was considered insufficient; there was no clear evidence for the effect of the interventions on medication adherence. Findings from the multicomponent behavioral interventions were mixed. Of the seven studies examining multicomponent interventions, four studies (Byerly et al. 2005, Kemp et al. 1998, O'Donnell et al. 2003, Skarsholm et al. 2014) included compliance therapy, and two of these studies found significant

improvement in medication adherence. The first used compliance therapy with no comparison group and found significant adherence improvement at 1 month (Byerly et al. 2005) but no differences by 6-month follow-up. The second (Kemp et al. 1998) (an RCT) found that compliance therapy resulted in significantly better adherence from baseline up to 18 months compared to nonspecific counseling. Three more RCTs of multicomponent interventions found no benefit over comparators on medication adherence; two of these studies used adherence therapy (Gray et al. 2006, Schulz et al. 2013) and one (Bechdolf et al. 2005) compared CBT plus motivational interviewing with group psychoeducation plus motivational interviewing.

Two studies examined interventions for medication adherence in patients receiving a depot antipsychotic. The first (Lee et al. 2010) tested an intervention for family members, psychoeducation, and early warning sign detection compared to treatment as usual. Medication compliance was significantly higher in the intervention group compared to treatment as usual at 1- and 2-year follow-up. The second study (Sajatovic et al. 2013) examined depot treatment combined with a multicomponent behavioral intervention with no comparison group. Adherence was significantly better compared to baseline up to 25 weeks.

A study of pharmacist-led informational group sessions (Kavanagh et al. 2003) and another RCT (Skarsholm et al. 2014) using a system-level intervention compared to compliance therapy found no effect on adherence. There was insufficient evidence to determine the effectiveness of a range of other interventions including cognitive adaption therapy (Frangou et al. 2005, Velligan et al. 2012), motivational interviewing (Barkhof et al. 2013), and shared decision making (Hamann et al. 2007).

Interventions targeted toward those with bipolar disorder were promising (Bahredar et al. 2014; Javadpour et al. 2013; Sajatovic et al. 2009, 2012). Two studies using psychoeducation (Bahredar et al. 2014, Javadpour et al. 2013) and a third that evaluated a multicomponent behavioral intervention (customized assignment of one to four modules of psychoeducation, substance use/modified motivational enhancement therapy, provider communication, or medication management) (Sajatovic et al. 2012) found improvements in medication adherence. However, the standard of evidence was deemed insufficient to draw conclusions regarding the association with medication adherence.

## FUTURE DIRECTIONS

Despite exciting growth in research regarding interventions for CVD risk behaviors among people with SMD, the sad reality is that many people with SMD live with stigma, in isolation and poverty, and remain vulnerable to CVD. This context hinders suggestions for further research along traditional behavior change lines. Above, we have cited Speyer and colleagues' (2019) poignant suggestion that further research could evaluate interventions designed to address other causes of unhealthy lifestyles, such as loneliness and low socioeconomic status, or structural interventions facilitating healthy food consumption and attractive possibilities for physical activity. Further, they recommend that tighter regulation of the food and tobacco industries might help protect people with SMD from CVD.

While we await such a commendable broader, societal approach, it is time to shift focus from achieving reductions in CVD risk behaviors well after they have become problematic. Results to date are modest at best. Focusing on the following areas will support early intervention to prevent development of CVD risk behaviors:

- The area of most pressing need overall is to evaluate lifestyle interventions delivered from the start of mental health treatment to prevent adoption of CVD risk behaviors or to reduce them before CVD risk is significantly increased.

- Clinical psychologists have an important role to play in future research. There is a need for sufficiently powered studies of the efficacy and effectiveness of transdiagnostic approaches in reducing multiple CVD risk behaviors among people with SMD. Clinical psychologists can use transdiagnostic models, such as those involving dual information processes, to guide interventions, combining with other disciplines such as exercise physiology and dietetics to most efficiently address multiple behaviors simultaneously in a collaborative approach with recipients.
- Given that many people with SMD take medications for mental and physical health issues, medication adherence has a potentially large impact. RCTs are needed that examine interventions for medication adherence with active comparison conditions and adequate power to detect differences.
- Finally, poor sleep is almost ubiquitous among people with mental health concerns. Larger trials of adapted CBTi for better sleep in people with SMD are needed to estimate effects with greater precision.

## CONCLUSION

There has been a burgeoning interest in redressing the physical health and longevity of people living with SMD. Multiple CVD risk behaviors are common among people with SMD. Research suggests a need for early intervention and prevention of the onset of moderate to severe CVD risk behaviors and their sequelae. Reductions in CVD risk behaviors are often associated with improvements in mental as well as physical health, providing a foundation for a holistic approach. While research has tended to focus on single CVD risk behaviors, a transdiagnostic approach to intervention based on dual-process theory and using motivational interviewing, CBT, mindfulness, and family interventions is suggested as the way forward. Clinical psychologists are well placed to conduct assessments, preferably in the context of a multidisciplinary team setting, and to develop shared case formulations with clients, significant others, and team members to collaboratively develop interventions for people with SMD and multiple CVD risk behaviors.

## SUMMARY POINTS

1. Seven cardiovascular disease (CVD) risk behaviors—smoking, physical inactivity, excessive alcohol consumption, low fruit and vegetable intake, inadequate sleep, poor social participation, and poor medication adherence—are highly prevalent among people with severe mental disorder, and they also influence mental health and well-being.
2. Clients should be given access to evidence-based interventions from the start of mental health treatment, including those with intact metabolic health, as there is little support for implementing individualized lifestyle interventions to counteract weight gain.
3. There is strong evidence that smoking cessation interventions consisting of cognitive behavioral therapy (CBT) and pharmacotherapy are associated with reductions in smoking and CVD risk.
4. A transdiagnostic approach to intervention based on motivational interviewing, CBT, mindfulness, and family interventions can be applied across CVD risk behaviors.
5. Interventions can be delivered effectively by telephone.

## DISCLOSURE STATEMENT

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Provides a monitoring tool to assist clients in preparation for and during smoking cessation.

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## RELATED RESOURCES

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