ITALIAN JOURNAL OF PSYCHIATRY
2024;10:39-47; doi: 10.36180/2421-4469-2024-571

REVIEW

Promotion of physical health and healthy lifestyle behaviors in patients with severe mental disorders

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Summary

The increased incidence of cardiovascular and metabolic diseases, such as obesity, dyslipidaemia, diabetes and metabolic syndrome has led to a significantly reduced life expectancy for patients with severe mental disorders (SMD). The primary cause of the high comorbidity rates between mental and physical illnesses is the adoption of unhealthy lifestyle behaviors, such as poor diet and physical inactivity, heavy smoking, alcohol or drug abuse, and limited access to screening programs and medical check-ups for physical conditions. Additional factors include the presence of cognitive deficits, depressive symptoms, p, neglect of physical health needs by patients and caregivers, and the metabolic side effects of psychotropic medications, such as antipsychotics, mood stabilizers, and antidepressants. The need to improve the physical healthcare for people with SMD through medical screenings, monitoring, and regular check-ups, as well as the need to provide psychosocial interventions aimed at modifying risk factors, such as unhealthy lifestyle behaviors, has been highlighted recently. Furthermore, changes to the healthcare system and delivery of care may be necessary to address the inadequate medical healthcare provided to patients with SMD. Aims of the present paper are to provide: 1) an overview of the most frequent comorbidities reported by patients with SMD; 2) results coming from the LIFESTYLE trial, a randomized controlled trial on the impact of a behavioural lifestyle intervention on physical exercise in patients with SMD; 3) recommendations for monitoring the physical health of people with SMD.

Keywords: comorbidities, mental disorders, physical health, life expectancy, lifestyle, mortality, promotion, behavioural interventions

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How to cite this article:
Luciano M, Della Rocca B, Di Vincenzo M, et al. Promotion of physical health and healthy lifestyle behaviors in patients with severe mental disorders. Italian Journal of Psychiatry 2024;10:39-47; https://doi.org/10.36180/2421-4469-2024-572

INTRODUCTION

In recent decades, while global life expectancy has significantly increased, the number of years people live without illness has not increased at the same pace [1]. Along with an increase of life expectancy, comorbidity rates of general population have increased significantly. The presence of physical comorbidities is linked to a notable decline in quality of life, impairments in personal and social functioning, and reduced autonomy [2,3]. Even among younger individuals, comorbidity is rapidly increasing, with its adverse effects being as numerous and severe as those seen later in life [4].

The number of people with comorbidities will rise in the years to come, due to several factors including the aging of the population [5], the tendency to adopt unhealthy lifestyle behaviors, climate changes and environmental pollution. Comorbidity is not merely the coexistence of two independently developing diseases; the prognosis of all existing diseases worsens when two or more are present simultaneously, increasing the number and severity of complications and making treatment more challenging and potentially less effective. Furthermore, one of the concurrent disorders is often overlooked.

The situation becomes even more critical when considering comorbidity between physical and mental illnesses. People with severe mental disorders (SMD), including affective disorders and schizophrenia spectrum disorders, have significantly higher rates of physical illnesses compared to the general population. These physical illnesses are usually associated with worse prognoses and increased mortality [6,7]. According to available estimates, people with serious mental problems have a life expectancy loss of at least 10 to 25 years, mainly due to cardiovascular, metabolic, and infectious diseases [8-10].
In this article we provide: 1) an overview of most frequent comorbidities reported by patients with SMD; 2) recommendations for monitoring physical health of people with SMD; 3) a description of the efficacy of behavioral lifestyle intervention to improve physical health of people with SMD.

PHYSICAL COMORBIDITIES OF PATIENTS WITH SMD

Individuals with SMD and comorbid obesity experience a notable decrease in life expectancy and are more susceptible to various medical conditions, such as type 2 diabetes mellitus (Relative Risk, RR, > 3), cardiovascular disease (CVD) (RR > 2-3), dyslipidaemia (RR > 3), hypertension (RR > 2-3), respiratory issues (RR > 3), reproductive hormone abnormalities (RR > 1-2), and certain cancers, like colon cancer (RR > 1-2) [11].
People with SMD are more prone than the general population to being overweight, obese, and having abdominal obesity. These conditions are linked to a higher risk of acute cardiovascular events, even in early illness stages and without medication. However, the obesity risk varies by diagnosis among SMD patients [11]. Compared with the general population, individuals with major depressive disorder (MDD) or bipolar disorder (BD) have up to 1.5 times higher obesity risk, while those with schizophrenia spectrum disorder have over four times higher risk [12].
The prevalence of metabolic syndrome in people with mental disorders ranges from 29.4% to 67.9%, with rates 1.58 times higher than in the general population [13]. Among those referred to mental health centers, 81.7% have untreated lipid abnormalities and 63.9% have untreated glycaemic alterations, highlighting the neglect of physical health in this group. Use of psychotropic drugs is another factor that should be considered among the causes of obesity in patients suffering from SMD [11]. Weight gain is a common side effect of antipsychotics (AP), affecting 15 to 72% of patients receiving treatment for schizophrenia [14-16]. Mood stabilizers also can contribute to weight gain, though less frequently associated with obesity compared to antipsychotics; lithium causes weight gain in 77% of patients, averaging 4-6.3 kg, likely due to increased appetite, hypothyroidism, and nephrogenic diabetes insipidus. Up to 50% of patients on valproate experience weight gain, independently from the dosage [17,18].
Antidepressants (AD) pose a modest risk of weight gain. In MDD patients, long-term use (over 6 months) and polypharmacy with ADs like mirtazapine, amitriptyline, and paroxetine can lead to weight gain of up to 2.7 kg. However, the impact varies individually, especially in the long-term [12].
The significant individual variation in medication-induced weight gain suggests that genetic factors may influence susceptibility. Despite promising outcomes, the role of hereditary factors in predicting this side effect remains a possibility.
Cardiovascular diseases (CVD) are a leading cause of premature death among individuals with severe mental disorders (SMD), reducing life expectancy by 17.4% in men and 22.0% in women. Those with schizophrenia and bipolar disorder face a 2- to 3-fold higher risk of CVD [19]. The etiology of this excess CVD is multifactorial, and the different causes can be grouped in three major categories: genetic causes, modifiable lifestyle factors and iatrogenic causes [20-25]. Particularly, individuals with depression have a 50% increased risk of CVD compared to the general population, with depression being an independent risk factor for coronary heart disease [20,26].
The complex interplay between genetic, environmental, and mental health factors makes managing physical comorbidities in SMD patients challenging. Therefore, screening for cardiovascular disorders in SMD patients is crucial.
Moreover, it has been reported that patients with SMD are at a higher risk of developing chronic viral infections, particularly those caused by HIV and hepatitis C viruses [11]. The prevalence of HIV positivity among SMD patients surpasses that of the general population [27-30], largely due to factors such as high substance abuse rates, risky sexual behaviors (e.g., unprotected sex or exchanging sex for drugs/money), and insufficient awareness of HIV-related issues [11]. About 5 to 7% of individuals with a history of mental illness have HIV infection [31]. Even though schizophrenia patients are less likely to be sexually active than nonpsychotic individuals, they engage more frequently in high-risk sexual behaviors and often lack awareness of HIV's negative consequences. Furthermore, the prognosis for schizophrenia patients co-infected with HIV is poorer [31]. Between 0.2 and 15% of people with HIV-spectrum illness may develop new-onset psychosis. Whether HIV or schizophrenia appears first, their co-occurrence leads to higher morbidity and mortality than either condition alone. Studies also indicate that HIV patients are more prone to depressive symptoms compared to HIV-negative individuals [30].
Reports from various continents show that hepatitis virus infection rates are significantly higher in people with SMD compared to the general population. Hepatitis C virus infects approximately 20-25% of people with SMD, primarily transmitted through drug use and high-risk sexual behaviors. Routine screening and treatment for hepatitis C virus infection in SMD patients with substance use disorders are crucial to reduce related morbidity and mortality [11].
People with schizophrenia and depression also have a two-fold increased risk of developing tuberculosis (TB) compared to the general population [11]. TB comorbidity with severe mental illness is complex, as it is strongly associated with several SMD risk factors, including HIV, diabetes, homelessness, poverty, and substance abuse [32]. Additionally, patients

in long-term care facilities are more susceptible to infectious diseases, including TB, due to inadequate infection control measures or high population density.

FACTORS INVOLVED IN THE INCREASED MORTALITY IN PATIENTS WITH SMD

The increased mortality rates among people with SMD are partly due to the historical separation of psychiatry from other medical branches and the inadequate focus on comorbidities in the training of psychiatrists and other medical specialists [33]. Health care professionals have long underestimated the prevalence of comorbidity, while patients have been hesitant to discuss physical health problems with psychiatrists.

The reduced life expectancy of patients with SMD can be attributed to three main categories: patient-related factors, clinician-related factors, and healthcare system factors [32]. Despite the principle that equal access to healthcare is a fundamental human right, individuals with SMD often face barriers to receiving adequate care and high-quality treatments due to a combination of patient, provider, treatment, and system factors [32,34].

Patient-related factors include reluctance to seek medical attention due to symptoms of their mental disorders, such as cognitive impairment, social isolation, depressive symptoms, and distrust. Consequently, SMD patients often engage in unhealthy behaviors like a sedentary lifestyle, heavy smoking, poor physical activity, unhealthy diets, and substance abuse. Psychiatric symptoms and their adverse effects (e.g., reduced social networks, low education levels, poor housing, lack of family support, poverty, and unemployment) further complicate understanding healthcare advice and making necessary lifestyle changes. Thus, SMD patients may struggle more than others to recognize physical symptoms, communicate their needs to healthcare providers, and manage self-care [6].

Additionally, SMD patients often receive less medical attention than those with purely physical illnesses, partly due to poor communication between patients and healthcare workers [35]. Stigmatizing attitudes among non-mental health professionals towards SMD patients contribute to the lower quality of care they receive [36-39]. For instance, cardiovascular risk screening in SMD patients is rare and depends on the healthcare system's structure, doctors' expertise, and the level of collaboration between cardiologists and psychiatrists [40].

The need to enhance physical healthcare for people with SMD through medical screenings, monitoring, regular check-ups, and psychosocial interventions to modify risk factors like unhealthy behaviors has been emphasized recently [41]. Furthermore, systemic changes in healthcare delivery may be necessary to address the inadequate medical care provided to SMD patients.

The fragmentation of medical and mental health systems, driven by high costs and under-resourced mental health care, prevents integrated healthcare systems. This fragmentation contributes to higher comorbidity and mortality rates among this patient population.

ADDRESSING PHYSICAL COMORBIDITIES IN PATIENTS WITH SMD - THE LIFESTYLE TRIAL

Many patients with SMD are either unaware of the need for lifestyle changes or lack the information and skills to make these changes. Efficient behavioral interventions by psychiatric specialists, medical professionals, nurses, and other multidisciplinary team members can inform and encourage individuals with SMD to address their lifestyle choices, such as smoking, nutrition, and exercise [42,43].

Patients with SMD, along with their family members and caregivers, should be educated about healthy behaviors and receive psychoeducational materials to improve their lifestyle habits. Population-based research has shown that lifestyle choices can be measured and improved through specific psychoeducational interventions, usually referred to as "lifestyle interventions" [41,44,45]. These programs promote better behavioral outcomes without pharmacological aids. They are cost-effective, do not require administration by specialists, nor need special training, but should be managed by mental health professionals. Many such interventions have been tested for efficacy in randomized controlled trials (RCTs) [44,45].

Lifestyle interventions encompass various approaches, including health education and cognitive behavioral therapy (CBT), and practical elements like physical activity. They can be provided in different settings, such as in-person, over the phone, or online, in both individual and group formats. Systematic review data has demonstrated that lifestyle interventions can significantly improve anthropometric measures like waist circumference, body weight, and body mass index (BMI), as well as physical activity and dietary outcomes like fruit consumption [42,46,47]. Moreover, lifestyle modifications are linked to a lower risk of all-cause mortality, type 2 diabetes, metabolic syndrome, and cardiovascular disease. A recent review of RCTs on lifestyle interventions for individuals with SMD in community or outpatient settings found significant improvements in weight, physical activity, and diet [44]. Additionally, these interventions led to significant decreases in blood levels of insulin, triglycerides, total cholesterol, and fasting glucose [42,44,46,47]. However, the majority of these studies only had brief follow-ups, making the conclusions non-definitive. No research has explicitly examined the impact of lifestyle modifications on complex cardiovascular indices. Despite the positive effects on psychosocial wellbeing, quality of life, and symptom severity, many RCTs have methodological flaws, such as high risk of bias, lack of blinding, and small sample sizes [42].

The LIFESTYLE intervention

To promote the physical health of people with SMD, our study group developed a behavioral group intervention. This intervention proved effective in RCTs conducted with 400 patients with bipolar disorders, major depression, or schizophrenia spectrum disorder. The LIFESTYLE intervention was developed according to recommendations from the World Health Organization, the European Association for the Study of Diabetes, the European Society of Cardiology, and the European

Psychiatric Association for managing physical health in individuals with mental disorders.The LIFESTYLE study is a multicentric, randomized controlled trial with blinded outcome assessments, conducted at outpatient units of six Italian universities: Campania "Luigi Vanvitelli" in Naples, Bari, Genoa, L'Aquila, Pisa, and Rome-Tor Vergata. Each center aimed to recruit 70 patients, randomly allocated in two groups, totaling 420 participants. Funded by the Italian Ministry of Education, Universities and Research under the "Progetti di Rilevante Interesse Nazionale (PRIN)" framework, the study required informed written consent from all participants. Patients were randomly assigned to experimental or control groups, considering factors like center, age, gender, and education, in a 1:1 ratio. Eligibility criteria included: (1) ages 18-65; (2) primary diagnosis of schizophrenia, schizoaffective disorder, delusional disorder, other psychotic disorders, major depressive disorder, or bipolar disorder per DSM-5, confirmed by the Structured Clinical Interview (2013); (3) BMI ≥ 25; and (4) ability to provide written consent. Exclusion criteria were: (1) inability to perform moderate physical activity; (2) pregnancy or breastfeeding; (3) intellectual disability or severe cognitive impairment; (4) recent psychiatric symptom worsening or hospital admission within the last three months. Blinded researchers and statisticians conducted patient assessments.

The experimental intervention, lasting five months, was designed using techniques from psychoeducation, motivational intervention, and cognitive-behavioral therapy, following WHO, European Association for the Study of Diabetes, European Society of Cardiology, and European Psychiatric Association guidelines. Detailed methodology is in Sampogna et al. (2018). Sessions for groups of 5-10 patients every 7-10 days covered topics like healthy diet, physical activity, smoking habits, medication adherence, risky behaviors, and circadian rhythms. Each session included information on lifestyle behaviors, strategies to change unhealthy behaviors, identification of personal goals, motivation, and problem-solving. Sessions encouraged discussion and interaction, ending with 20 minutes of moderate physical activity. Fresh fruits and healthy snacks were provided (Tab. I).

TABLE I. Programme of the LIFESTYLE intervention.

Programme of LIFESTYLE psychosocial group intervention Sessions are held every 7-10 days
Starting session: Introduction of the intervention, aims, purposes, presentation of participants, and definition of personal healthy lifestyle goals.
Module 1: Diet, information on health food, principles, and benefits of healthy eating.
Module 2: Physical activity, how to increase routine physical activity.
Module 3: Smoking habits, information on the dangers of smoking, craving, difficulties for quitting smoking and consequences of long-term abuse of nicotine.
Module 4: Medication adherence, strategies for improving adherence, medical consequences of non-adherence.
Module 5: Risky behaviors, sexually transmitted disorders, substance, and alcohol abuse.
Module 6: Promotion of regular circadian rhythm, problems related to irregular daily activities.
At the end of each meeting, a 20-min session of moderate physical activity (i.e., walking) is implemented with participants.

The control intervention comprised five weekly sessions for groups of 5-10 patients, covering healthy lifestyle, early detection of relapses, effects and management of pharmacological treatment, stress management, and problem-solving techniques. Manuals ensured consistent treatment across centers. Researchers were blinded to patients' allocation. All participants underwent assessments at baseline (T0) and six months post-randomization (T1). Diagnoses were confirmed using the Structured Clinical Interview for DSM-5 (SCID-5). Various assessment tools were employed: (a) the Brief Psychiatric Rating Scale (BPRS), comprising 24 items grouped into four subscales (positive symptoms, negative symptoms, depressive-anxiety symptoms, and manic/hostility symptoms) [48]; (b) the Personal and Social Performance Scale (PSP), a 100-point scale measuring overall functioning, subdivided into 10 intervals [49]; (c) the Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS) Consensus Cognitive Battery (MCCB) - brief version, including tests like Trail Making Test - part A, Symbol Coding, and Category Fluency-Animal Naming [50].

Patients' physical activity levels were assessed using the 18-item International Physical Activity Questionnaire (IPAQ) - short form. IPAQ scores were calculated as categorical (low, medium, high physical activity) or continuous variables (METs). The questionnaire's reliability and validity for assessing physical activity in severe mental disorders approximate those in the general population, with test-retest reliability at 0.68 and criterion validity at 0.37 [51].

Additionally, patients' lifestyle behaviors were assessed using a 24-item questionnaire developed by the Italian National Institute of Health. This questionnaire covered dietary patterns, smoking habits, and physical activity specifics. Inter-rater reliability was assessed using Cohen's Kappa coefficient, yielding satisfactory results for both PSP (K = 0.918) and BPRS (K ranging from 0.835 to 0.972), with SCID-5 diagnoses achieving 100% agreement. Results presented in this paper come from the Naples' sample.

Sociodemographic and clinical characteristics at baseline (T0)

The sample comprised 75 patients, with a mean age of 48.1 ± 10.6 years. The majority were female (53.7%) and unemployed (62.7%). Additionally, 41.3% of participants were unmarried. Patients had been under the care of mental health services for an average of over five years (62.9 months ± 62.8) and had an average illness duration of 20.35 ± 12.15 years. Diagnoses included bipolar disorder (48%), depression (29.3%), and schizophrenia spectrum disorders (22.7%). On average, patients had experienced

1.63 ± 3.86 voluntary and 0.33 ± 0.92 involuntary hospitalizations. Mood stabilizers were the most commonly prescribed medications (68%), followed by antidepressants (52%) and benzodiazepines (48%). Typical antipsychotics were used by 17.3% of participants, while atypical antipsychotics were used by 56%. Among those on antipsychotics, 30.7% were on metabolically problematic medications (MPM), and 36% were on less impacting medications (LIM). The most frequently used antipsychotics were aripiprazole (19%), quetiapine (19%), and olanzapine (13%).

The mean scores on the Brief Psychiatric Rating Scale (BPRS) were 5.01 ± 1.62 for positive symptoms, 6.80 ± 2.35 for negative symptoms, 4.32 ± 1.45 for manic symptoms, 3.56 ± 1.34 for hostility, and 8.60 ± 3.2 for anxiety and depression. The mean scores for the Personal and Social Performance Scale (PSP) and the Manchester Short Assessment of Quality of Life (MANSA) were 71.44 ± 15.55 and 4.06 ± 0.99, respectively.

Significant differences were found between the MPM and LIM groups regarding employment (17.4% in the MPM group vs. 44.4% in the LIM group; $p < .05$) and the percentage of patients on atypical antipsychotics (100.0% in the MMP group vs. 70.4% in the LIM group).

Anthropometric and metabolic parameters at baseline (T0)

The average weight was 89.50 ± 14.86 kg, with a mean BMI of 32.25 ± 4.86, indicating grade I obesity. Nearly one-fourth of patients (24%) had a BMI ≥ 35 (grade II and III obesity). The mean waist circumference was 106.41 ± 12.56 cm. Almost half of the patients (49.3%) had metabolic syndrome, and 41.3% exhibited insulin resistance, with a mean HOMA-IR of 3.13 ± 3.39 and blood glucose level of 103.03 mg/dl (± 41.65). Baseline lipid profile showed triglycerides at 157.25 ± 65.90 mg/dl and total cholesterol at 196.24 ± 31.78 mg/dl. HDL and LDL levels were 49.37 ± 11.08 mg/dl and 122.43 ± 29.16 mg/dl, respectively. Cardiovascular risk scores (Framingham) were 10.07 ± 4.41 for current risk and 9.45 ± 6.93 for 10-year risk.

Univariate analysis revealed a significantly higher percentage of grade I obesity in the LIM group (63%) compared to the MMP group (34.8%; $p < .05$), though the MPM group had significantly higher diastolic blood pressure (83.04 ± 8.35 vs. 78.14 ± 6.67; $p < .05$).

Lifestyle

A significant percentage of participants (78.7%) did not engage in regular physical activity, and 64% walked less than 30 minutes daily. Over 60% of the sample was physically inactive based on the IPAQ. Among employed patients, 48.1% commuted by car, 50% had sedentary jobs, and 50% used a computer for over five hours daily. Nicotine dependence was prevalent in 53.3% of patients, with 70% smoking more than 20 cigarettes daily. Sixty-five percent had attempted to quit smoking at least once. Alcohol consumption was reported by 40%, 48% regularly drank soft drinks, and 85.3% consumed coffee. Over 75% regularly ate red meat (88%) and processed meats (77.3%). No significant lifestyle differences were found between the MPM and LIM groups.

Efficacy of LIFESTYLE intervention after 6 months

Fourteen participants were on MPMs, while eleven were on LIMs. After six months, patients on LIMs who received the LIFESTYLE intervention (N = 8) showed significant reductions ($p < .05$) in mean insulin levels (6.43 ± 2.77) and HOMA index (1.41 ± 0.64), and improved MANSA scores (59.50 ± 10.55). In the control group with LIMs (N = 3), significant reductions in total cholesterol (164.33 ± 29.50 mg/dL, $p < .05$) and LDL cholesterol (96 ± 18, $p < .01$) were observed.

No significant differences were found in metabolic indices, cardiovascular risk, and quality of life between the experimental (N = 8) and control (N = 3) MPM groups after six months.

Correlations and regressions

At follow-up, BMI was significantly correlated with waist circumference, number of involuntary hospitalizations ($p < .01$), blood glucose, insulin levels, duration of care, number of voluntary hospitalizations, and negative symptoms on the BPRS ($p < .05$). There was a negative correlation with years of education ($p < .05$).

Linear regression indicated that the number of months under mental health service care ($p < .05$) and the number of involuntary hospitalizations ($p < .01$) were significant predictors of BMI at follow-up, while years of education were a negative predictor ($p < .05$).

MONITORING GUIDELINES

Results of the LIFESTYLE trial and other international evidence constitutes the scientific base to produce recommendation both for the screening and the treatment of physical health of patients with SMD which are summarized in Tables II and III. Many of these tests are easy, affordable, and simple to administer, making them feasible to include in healthcare systems of both developed and developing countries. Moreover, various health professionals, not just doctors, can regularly perform these measurements, such as body weight and blood pressure. The patient's personal and family history should include diabetes mellitus (DM), hypertension, and CVD risk fac-

TABLE II. Clinical physical information to be monitored in patients with SMD.

- Weight gain and obesity (body mass index, BMI; waist circumference)
- Blood pressure
- Dietary intake
- Activity level and exercise
- Use of tobacco and alcohol or other substances
- Fasting blood levels of glucose
- Fasting blood levels of lipids, especially triglycerides and high-density lipoprotein (HDL)-cholesterol
- Prolactin levels (if indicated by reproductive system and/or sexual symptoms)
- Cardiovascular disease (CVD) risk and electrocardiographic (ECG) parameters

TABLE III. Screening and monitoring recommendations.

	Baseline	3 months	12 months	Yearly
Personal and family history	X			
Diet, exercise, smoking	X	X	X	X
Weight	X	X	X	X
Waist circumference	X	X	X	X
ECG	X			X
Blood pressure	X	X	X	X
Fasting plasma glucose	X	X	X	X
Lipid profile	X		X	X

tors (e.g., myocardial infarction or cerebrovascular accident, including age at onset). Assessing lifestyle habits, such as smoking, diet, and physical activity, should be prioritized in screening and assessing physical health 52,53. Given the importance of each metabolic syndrome component in predicting the morbidity and mortality of CVD, diabetes, cancer, and other related diseases, these parameters should be checked at baseline and monitored regularly [11,32].

Psychiatrists should encourage patients to track and chart their own weight at each visit to monitor obesity and the risk of metabolic syndrome, and possibly CVD, regardless of the medication provided. Waist circumference (WC) is considered a more practical measurement than body mass index (BMI). Prospective studies indicate that WC is a better predictor of type 2 diabetes and is a stronger indicator than BMI for systolic blood pressure, HDL cholesterol, and triglycerides [54,55].

Other metabolic syndrome criteria, such as blood pressure, fasting plasma glucose, and fasting lipid profile, should also be evaluated [32]. The presence of one metabolic syndrome component often indicates the presence of others, as they tend to cluster together. High blood pressure is frequently overlooked in SMD patients [56]. Given the low cost and significance of hypertension as a CVD risk factor, blood pressure should be checked frequently, if not at every visit. Patients with blood pressure readings between 120 and 130 mmHg or between 80 and 85 mmHg should be considered pre-hypertensive and encouraged to make lifestyle changes to prevent heart disease [11,32].

Based on published recommendations, regional protocols, or online risk calculators, the patient's individual CVD risk should be assessed using factors such as age, sex, presence or absence of DM, smoking behavior, systolic blood pressure, total cholesterol, or the ratio of total cholesterol to HDL-cholesterol [32]. These measures are simple and readily available. Baseline ECG monitoring should be considered for individuals with SMD to evaluate overall heart health [32]. Obtaining an ECG in a psychiatric setting can be challenging, similar to other acute medical settings. In such cases, patients should be questioned about heart risks, such as family history of early cardiac death, personal history of a heart murmur, previous prescription of cardiac medications or anti-hypertensives, or experiences of simple syncope before receiving any psychotropic medication from a psychiatrist [52,57]. It is advisable for every patient to get an ECG check before starting any medication, especially those with clinical risk factors for arrhythmias, such as family history of early cardiac death, personal history of a heart murmur, hypertension or diabetes, resting tachycardia, irregular heartbeats, and fainting spells. ECG monitoring can then be repeated based on a cardiologist's recommendation [33,52,53].

Physical screening and monitoring programs are widely applicable and well-received by patients. Contrary to popular belief, most patients are easily persuaded to participate in physical tests and are eager to learn and discuss the results. Follow-up monitoring should be conducted at appropriate times [32,57]. Physical health evaluations should be documented on charts relating times and outcomes to reference ranges [32]. Monitoring all patients on any drug at baseline and, at the very least, every three months, is highly advisable to identify high-risk individuals and ensure early detection of changes in metabolic markers [58]. Other guidelines recommend screening and monitoring at baseline, 3 months, 12 months, and annually unless patients are at higher risk for negative health outcomes (e.g., family history of diabetes or early cardiac death, being overweight or obese, having experienced gestational diabetes, belonging to a minority ethnic group, etc.) [56,59,60].

CONCLUSIONS

The physical health challenges faced by individuals with severe mental disorders (SMD) remain a pressing concern, necessitating coordinated efforts at both systemic and individual levels [61]. A multidisciplinary approach is essential, involving regular monitoring and screening for prevalent diseases, along with supportive interventions aimed at enhancing cognitive, social functioning, and lifestyle improvements in SMD patients. Addressing discrimination and stigmatization within communities and medical settings remains paramount from both clinical and social perspectives.

However, much remains to be understood regarding the factors that determine the effectiveness of lifestyle interventions. Existing research indicates that interventions are more successful in enhancing physical health outcomes when they incorporate dietary and physical activity components, personalized goal setting, and motivational aspects [42,62]. The implementation of these interventions in routine clinical practice poses significant challenges. Few studies have evaluated their cost-effectiveness or scalability in everyday healthcare settings. Moreover, understanding patients' individual experiences and satisfaction with these interventions is crucial.

Given the intricate interaction between mental and physical health factors contributing to the reduced life expectancy of SMD patients, a comprehensive, multilevel approach is warranted. This approach should involve collaboration among various stakeholders, including policymakers, psychiatrists,

other medical professionals, patients, and caregivers, to establish sustainable frameworks for managing both mental and physical health conditions in the long term.

Conflicts of interest statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Ethical consideration

This study was conducted in accordance with globally accepted standards of good practice, in agreement with the Declaration of Helsinki and with local regulations. A formal ethical approval for conducting the trial was obtained by the Coordinating Center's Ethics Committee, which approved the whole study protocol in January 2017 (approval number: prot. 64). All recruited patients gave written informed consent to participate in the study. This work was supported by the Italian Ministry of Education, Universities and Research within the framework of the "Progetti di Rilevante Interesse Nazionale (PRIN) — year 2015". (Grant Number: 2015C7374S).

Authors' contribution

ML AF GS: writing original draft, conceptualization and supervision. BDR: writing original draft and data curation. MDV CT: critical revision of the manuscript. All authors: final approval of the manuscript.

References

1 Thornicroft G. Physical health disparities and mental illness: The scandal of premature mortality. British Journal of Psychiatry. 2011;199(6):441-442. https://doi.org/10.1192/bjp.bp.111.092718

2 Adriaanse MC, Drewes HW, van der Heide I, Struijs JN, Baan CA. The impact of comorbid chronic conditions on quality of life in type 2 diabetes patients. Quality of Life Research. 2016;25(1):175-182. https://doi.org/10.1007/s11136-015-1061-0

3 Sarkadi A, Kajsa Ådahl ·, Stenvall E, et al. Teaching Recovery Techniques: evaluation of a group intervention for unaccompanied refugee minors with symptoms of PTSD in Sweden. 2018;27:467-479. https://doi.org/10.1007/s00787-017-1093-9

4 Sartorius N. Comorbidity of mental and physical disorders: a key problem for medicine in the 21st century. Acta Psychiatr Scand. 2018;137(5):369-370. https://doi.org/10.1111/acps.12888

5 Bloom DE, Luca DL. The Global Demography of Aging. Published online 2016:3-56. https://doi.org/10.1016/BS.HESPA.2016.06.002

6 Momen NC, Plana-Ripoll O, Agerbo E, et al. Mortality Associated with Mental Disorders and Comorbid General Medical Conditions. JAMA Psychiatry. 2022;79(5):444-453. https://doi.org/10.1001/jamapsychiatry.2022.0347

7 Teh WL, Cetty L, Jeyagurunathan A, et al. Comorbid physical illnesses in adult outpatients with psychotic disorders: risk factors, psychological functioning, and quality of life outcomes. Soc Psychiatry Psychiatr Epidemiol. 2021;56(9):1633-1643. https://doi.org/10.1007/s00127-021-02034-8

8 Tan XW, Lee ES, Toh MPHS, et al. Comparison of mental-physical comorbidity, risk of death and mortality among patients with mental disorders — A retrospective cohort study. J Psychiatr Res. 2021;142:48-53. https://doi.org/10.1016/J.JPSYCHIRES.2021.07.039

9 Soundy A, Wampers M, Probst M, Hert M De, Stubbs B, Vancampfort D. Physical activity and sedentary behaviour in outpatients with schizophrenia: A systematic review and meta-analysis. Int J Ther Rehabil. 2013;20(12):588-595. https://doi.org/10.12968/ijtr.2013.20.12.588

10 Kisely S, Crowe E, Lawrence D. Cancer-Related Mortality in People With Mental Illness. JAMA Psychiatry. 2013;70(2):209-217. https://doi.org/10.1001/JAMAPSYCHIATRY.2013.278

11 De Hert M, Correll CU, Bobes J, et al. Physical illness in patients with severe mental disorders. I. Prevalence, impact of medications and disparities in health care. World Psychiatry. 2011;10(1):52-77. https://doi.org/10.1002/j.2051-5545.2011.tb00014.x

12 Mazereel V, Detraux J, Vancampfort D, van Winkel R, De Hert M. Impact of Psychotropic Medication Effects on Obesity and the Metabolic Syndrome in People With Serious Mental Illness. Front Endocrinol (Lausanne). 2020;11(October):1-10. https://doi.org/10.3389/fendo.2020.573479

13 Rødevand L, Bahrami S, Frei O, et al. Polygenic overlap and shared genetic loci between loneliness, severe mental disorders, and cardiovascular disease risk factors suggest shared molecular mechanisms. Transl Psychiatry. 2021;11(1):3. https://doi.org/10.1038/S41398-020-01142-4

14 Leucht S, Burkard T, Henderson J, Maj M, Sartorius N. Physical illness and schizophrenia: a review of the literature. Acta Psychiatr Scand. 2007;116(5):317-333. https://doi.org/10.1111/J.1600-0447.2007.01095.X

15 Bobes J, Rejas J, Garcia-Garcia M, et al. Weight gain in patients with schizophrenia treated with risperidone, olanzapine, quetiapine or haloperidol: results of the EIRE study. Schizophr Res. 2003;62(1-2):77-88. https://doi.org/10.1016/

16 De Hert M, Dobbelaere M, Sheridan EM, Cohen D, Correll CU. Metabolic and endocrine adverse effects of second-generation antipsychotics in children and adolescents: A systematic review of randomized, placebo controlled trials and guidelines for clinical practice. European Psychiatry. 2011;26(3):144-158. https://doi.org/10.1016/J.EURPSY.2010.09.011

17 Vancampfort D, Wampers M, Mitchell AJ, et al. A meta-analysis of cardio-metabolic abnormalities in drug naïve, first-episode and multi-episode patients with schizophrenia versus general population controls. World Psychiatry. 2013;12(3):240. https://doi.org/10.1002/WPS.20069

18 Bahrami S, Steen NE, Shadrin A, et al. Shared Genetic Loci Between Body Mass Index and Major Psychiatric Disorders: A Genome-wide Association Study. JAMA Psychiatry. 2020;77(5):1. https://doi.org/10.1001/JAMAPSYCHIATRY.2019.4188

19 Sampogna G, Di Vincenzo M, Della Rocca B, et al. Physical comorbidities in patients with severe mental disorders: a brief narrative review on current challenges and

practical implications for professionals. Riv Psichiatr. 2022;57(6):251-257. https://doi.org/10.1708/3922.39071

20 De Hert M, Dekker JM, Wood D, Kahl KG, Holt RIG, Möller HJ. Cardiovascular disease and diabetes in people with severe mental illness position statement from the European Psychiatric Association (EPA), supported by the European Association for the Study of Diabetes (EASD) and the European Society of Cardiology (ESC). European Psychiatry. 2009;24(6):412-424. https://doi.org/10.1016/J.EURPSY.2009.01.005

21 Mitchell AJ, Vancampfort D, De Hert M, Stubbs B. Do people with mental illness receive adequate smoking cessation advice? A systematic review and meta-analysis. Gen Hosp Psychiatry. 2015;37(1):14-23. https://doi.org/10.1016/J.GENHOSPPSYCH.2014.11.006

22 Stubbs B, Firth J, Berry A, et al. How much physical activity do people with schizophrenia engage in? A systematic review, comparative meta-analysis and meta-regression. Schizophr Res. 2016;176(2-3):431-440. https://doi.org/10.1016/J.SCHRES.2016.05.017

23 Vancampfort D, Firth J, Schuch F, et al. Physical activity and sedentary behavior in people with bipolar disorder: A systematic review and meta-analysis. J Affect Disord. 2016;201:145-152. https://doi.org/10.1016/J.JAD.2016.05.020

24 Schuch F, Vancampfort D, Firth J, et al. Physical activity and sedentary behavior in people with major depressive disorder: A systematic review and meta-analysis. J Affect Disord. 2017;210:139-150. https://doi.org/10.1016/J.JAD.2016.10.050

25 Dipasquale S, Pariante CM, Dazzan P, Aguglia E, McGuire P, Mondelli V. The dietary pattern of patients with schizophrenia: A systematic review. J Psychiatr Res. 2013;47(2):197-207. https://doi.org/10.1016/J.JPSYCHIRES.2012.10.005

26 Whooley MA, De Jonge P, Vittinghoff E, et al. Depressive Symptoms, Health Behaviors, and Risk of Cardiovascular Events in Patients With Coronary Heart Disease. JAMA : the journal of the American Medical Association. 2008;300(20):2379. https://doi.org/10.1001/JAMA.2008.711

27 Sacks M, Dermatis H, Looser-Ott S, Burton W, Perry S. Undetected HIV infection among acutely ill psychiatric inpatients. https://doi.org/101176/ajp1494544. 2006;149(4):544-545. https://doi.org/10.1176/AJP.149.4.544

28 Henning MP, Krüger C, Fletcher L. HIV sero-positivity in recently admitted and long-term psychiatric in-patients: prevalence and diagnostic profile. Afr J Psychiatry (Johannesbg). 2012;15(1):47-53. https://doi.org/10.4314/AJPSY.V15I1.7

29 Maj M. Psychiatric aspects of HIV-1 infection and AIDS. Psychol Med. 1990;20(3):547-563. https://doi.org/10.1017/S0033291700017050

30 Lofgren SM, Bond DJ, Nakasujja N, Boulware DR. Burden of Depression in Outpatient HIV-Infected adults in Sub-Saharan Africa; Systematic Review and Meta-analysis. AIDS Behav. 2020;24(6):1752-1764. https://doi.org/10.1007/S10461-019-02706-2/METRICS

31 Sampogna G, Di Vincenzo M, Della Rocca B, et al. Physical comorbidities in patients with severe mental disorders: a brief narrative review on current challenges and practical implications for professionals. Riv Psichiatr. 2022;57(6):251-257. https://doi.org/10.1708/3922.39071

32 De Hert M, Cohen D, Bobes J, et al. Physical illness in patients with severe mental disorders. II. Barriers to care, monitoring and treatment guidelines, plus recommendations at the system and individual level. World Psychiatry. 2011;10(2):138-151. https://doi.org/10.1002/j.2051-5545.2011.tb00036.x

33 Fiorillo A, Sartorius N. Mortality gap and physical comorbidity of people with severe mental disorders: the public health scandal. Ann Gen Psychiatry. 2021;20(1). https://doi.org/10.1186/S12991-021-00374-Y

34 Momen NC, Plana-Ripoll O, Agerbo E, et al. Mortality Associated with Mental Disorders and Comorbid General Medical Conditions. JAMA Psychiatry. 2022;79(5):444-453. https://doi.org/10.1001/jamapsychiatry.2022.0347

35 Colton CW, Manderscheid RW. PEER REVIEWED: Congruencies in Increased Mortality Rates, Years of Potential Life Lost, and Causes of Death Among Public Mental Health Clients in Eight States. Prev Chronic Dis. 2006;3(2):1-14. Accessed November 1, 2023. /pmc/articles/PMC1563985/

36 Fleischhacker WW, Cetkovich-Bakmas M, Hert M De, et al. Comorbid Somatic Illnesses in Patients With Severe Mental Disorders: Clinical, Policy, and Research Challenges. J Clin Psychiatry. 2008;69(4):3409. Accessed November 1, 2023. https://www.psychiatrist.com/jcp/comorbid-somatic-illnesses-patients-severe-mental

37 Kane JM. Creating a Health Care Team to Manage Chronic Medical Illnesses in Patients With Severe Mental Illness: The Public Policy Perspective. J Clin Psychiatry. 2009;70(suppl 3):3921. https://doi.org/10.4088/JCP.7075SU1C.06

38 Nasrallah HA, Meyer JM, Goff DC, et al. Low rates of treatment for hypertension, dyslipidemia and diabetes in schizophrenia: Data from the CATIE schizophrenia trial sample at baseline. Schizophr Res. 2006;86(1-3):15-22. https://doi.org/10.1016/J.SCHRES.2006.06.026

39 Druss BG, Bradford WD, Rosenheck RA, Radford MJ, Krumholz HM. Quality of Medical Care and Excess Mortality in Older Patients With Mental Disorders. Arch Gen Psychiatry. 2001;58(6):565-572. https://doi.org/10.1001/ARCHPSYC.58.6.565

40 Hassan S, Heinkel S, Burton A, et al. A qualitative study exploring the barriers and facilitators of implementing a cardiovascular disease risk reducing intervention for people with severe mental illness into primary care contexts across England: The "PRIMROSE" trial. BMC Health Serv Res. 2020;20(1):1-15. https://doi.org/10.1186/S12913-020-05643-2/TABLES/4

41 Fiorillo A, Luciano M, Pompili M, Sartorius N. Editorial: Reducing the mortality gap in people with severe mental disorders: The role of lifestyle psychosocial interventions. Front Psychiatry. 2019;10(JUN):1-3. https://doi.org/10.3389/fpsyt.2019.00434

42 De Rosa C, Sampogna G, Luciano M, et al. Improving physical health of patients with severe mental disorders: a critical review of lifestyle psychosocial interventions. Expert Rev Neurother. 2017;17(7):667-681. https://doi.org/10.1080/14737175.2017.1325321

43 Luciano M, Sampogna G, Amore M, et al. Improving physical activity and diet in patients with severe mental disorders: Results from the LIFESTYLE multicentric, real-world randomized controlled trial. Psychiatry Res. 2022;317(August). https://doi.org/10.1016/j.psychres.2022.114818

44 Bradley T, Campbell E, Dray J, et al. Systematic review of lifestyle interventions to improve weight, physical activity and diet among people with a mental health condition. Systematic Reviews 2022 11:1. 2022;11(1):1-31. https://doi.org/10.1186/S13643-022-02067-3

[45] Mucheru D, Hanlon MC, McEvoy M, Thakkinstian A, MacDonald-Wicks L. Comparative efficacy of lifestyle intervention strategies targeting weight outcomes in people with psychosis: A systematic review and network meta-analysis. JBI Database System Rev Implement Rep. 2019;17(9):1770-1825. https://doi.org/10.11124/JBISRIR-2017-003943

[46] Luciano M, Sampogna G, Amore M, et al. How to improve the physical health of people with severe mental illness? A multicentric randomized controlled trial on the efficacy of a lifestyle group intervention. European Psychiatry. 2021;64(1). https://doi.org/10.1192/j.eurpsy.2021.2253

[47] Luciano M, Sampogna G, Amore M, et al. How to improve the physical health of people with severe mental illness? A multicentric randomized controlled trial on the efficacy of a lifestyle group intervention. European Psychiatry. 2021;64(1). https://doi.org/10.1192/j.eurpsy.2021.2253

[48] Overall JE, Gorham DR. The Brief Psychiatric Rating Scale. Psychol Rep. 1962;10(3):799-812. https://doi.org/10.2466/PR0.1962.10.3.799

[49] Morosini PL, Magliano L, Brambilla L, Ugolini S, Pioli R. Development, reliability and acceptability of a new version of the DSM-IV Social and Occupational Functioning Assessment Scale (SOFAS) to assess routine social funtioning. Acta Psychiatr Scand. 2000;101(4):323-329. https://doi.org/10.1034/J.1600-0447.2000.101004323.X

[50] August SM, Kiwanuka JN, McMahon RP, Gold JM. The MATRICS Consensus Cognitive Battery (MCCB): Clinical and Cognitive Correlates. Schizophr Res. 2012;134(1):76. https://doi.org/10.1016/J.SCHRES.2011.10.015

[51] Cleland C, Ferguson S, Ellis G, Hunter RF. Validity of the International Physical Activity Questionnaire (IPAQ) for assessing moderate-to-vigorous physical activity and sedentary behaviour of older adults in the United Kingdom. BMC Med Res Methodol. 2018;18(1):1-12. https://doi.org/10.1186/S12874-018-0642-3/FIGURES/4

[52] Thornicroft G. Physical health disparities and mental illness: The scandal of premature mortality. British Journal of Psychiatry. 2011;199(6):441-442. https://doi.org/10.1192/bjp.bp.111.092718

[53] Sartorius N. Comorbidity of mental and physical disorders: a key problem for medicine in the 21st century. Acta Psychiatr Scand. 2018;137(5):369-370. https://doi.org/10.1111/acps.12888

[54] De Vegt F, Dekker JM, Jager A, et al. Relation of Impaired Fasting and Postload Glucose With Incident Type 2 Diabetes in a Dutch Population: The Hoorn Study. JAMA. 2001;285(16):2109-2113. https://doi.org/10.1001/JAMA.285.16.2109

[55] Wahrenberg H, Hertel K, Leijonhufvud BM, Persson LG, Toft E, Arner P. Use of waist circumference to predict insulin resistance: retrospective study. BMJ : British Medical Journal. 2005;330(7504):1363. https://doi.org/10.1136/BMJ.38429.473310.AE

[56] De Hert M, Dekker JM, Wood D, Kahl KG, Holt RIG, Möller HJ. Cardiovascular disease and diabetes in people with severe mental illness position statement from the European Psychiatric Association (EPA), supported by the European Association for the Study of Diabetes (EASD) and the European Society of Cardiology (ESC). European Psychiatry. 2009;24(6):412-424. https://doi.org/10.1016/J.EURPSY.2009.01.005

[57] Leucht S, Burkard T, Henderson J, Maj M, Sartorius N. Physical illness and schizophrenia: a review of the literature. Acta Psychiatr Scand. 2007;116(5):317-333. https://doi.org/10.1111/J.1600-0447.2007.01095.X

[58] Waterreus AJ, Laugharne JDE. Screening for the metabolic syndrome in patients receiving antipsychotic treatment: a proposed algorithm. Medical Journal of Australia. 2009;190(4):185-189. https://doi.org/10.5694/J.1326-5377.2009.TB02344.X

[59] Mackin P, Bishop DR, Watkinson HMO. A prospective study of monitoring practices for metabolic disease in antipsychotic-treated community psychiatric patients. BMC Psychiatry. 2007;7:1-6. https://doi.org/10.1186/1471-244X-7-28

[60] Winkel R van, Hert M De, Eyck D Van, et al. Screening for Diabetes and Other Metabolic Abnormalities in Patients With Schizophrenia and Schizoaffective Disorder: Evaluation of Incidence and Screening Methods. J Clin Psychiatry. 2006;67(10):19038. Accessed November 1, 2023. https://www.psychiatrist.com/jcp/screening-diabetes-metabolic-abnormalities-patients

[61] De Hert M, Dobbelaere M, Sheridan EM, Cohen D, Correll CU. Metabolic and endocrine adverse effects of second-generation antipsychotics in children and adolescents: A systematic review of randomized, placebo controlled trials and guidelines for clinical practice. European Psychiatry. 2011;26(3):144-158. https://doi.org/10.1016/J.EURPSY.2010.09.011

[62] Sampogna G, Di Vincenzo M, Rocca B Della, et al. Physical comorbidities in patients with severe mental disorders: a brief narrative review on current challenges and practical implications for professionals. Riv Psichiatr. 2022;57(6):251-257. https://doi.org/10.1708/3922.39071