Journal of Mental Health

ISSN: 0963-8237 (Print) 1360-0567 (Online) Journal homepage: http://www.tandfonline.com/loi/ijmh20

Psychoeducational intervention focused on healthy living improves psychopathological severity and lifestyle quality in psychiatric patients: preliminary findings from a controlled study

Francesco Saverio Bersani, Massimo Biondi, Marialuce Coviello, Andrea Fagiolini, Michele Majorana, Amedeo Minichino, Anna Carlotta Rusconi, Lucilla Vergnani, Roberto Vicinanza & Maria Antonietta Coccanari de' Fornari

To cite this article: Francesco Saverio Bersani, Massimo Biondi, Marialuce Coviello, Andrea Fagiolini, Michele Majorana, Amedeo Minichino, Anna Carlotta Rusconi, Lucilla Vergnani, Roberto Vicinanza & Maria Antonietta Coccanari de' Fornari (2017): Psychoeducational intervention focused on healthy living improves psychopathological severity and lifestyle quality in psychiatric patients: preliminary findings from a controlled study, Journal of Mental Health

To link to this article: http://dx.doi.org/10.1080/09638237.2017.1294741

Journal of MENTAL HEALTH

http://tandfonline.com/ijmh
ISSN: 0963-8237 (print), 1360-0567 (electronic)

J Ment Health, Early Online: 1–5
 DOI: 10.1080/09638237.2017.1294741

Taylor & Francis
Taylor & Francis Group

ORIGINAL ARTICLE

Psychoeducational intervention focused on healthy living improves psychopathological severity and lifestyle quality in psychiatric patients: preliminary findings from a controlled study

Francesco Saverio Bersani[1], Massimo Biondi[1], Marialuce Coviello[1], Andrea Fagiolini[2], Michele Majorana[1], Amedeo Minichino[1], Anna Carlotta Rusconi[1], Lucilla Vergnani[1], Roberto Vicinanza[3], and Maria Antonietta Coccanari de' Fornari[1]

[1]Department of Neurology and Psychiatry, Sapienza University of Rome, Italy, [2]Department of Molecular and Developmental Medicine, University of Siena, Italy, and [3]Department of Cardiovascular, Respiratory, Nephrologic and Geriatric Sciences, Sapienza University of Rome, Italy

ABSTRACT

Background: Individuals with psychiatric disorders incur an increased risk of morbidity and mortality, with higher prevalence of cardio-metabolic risk factors s largely contributing to a significant reduction in life expectancy.
Objectives: The aim of the present study was at evaluating the clinical effectiveness of an educational intervention targeting lifestyle habits in patients with mood and psychotic disorders.
Methods: Patients ($n = 32$) were randomly assigned to receive, in addition to the pharmacological treatment, either five sessions of group psychoeducation focused on healthy lifestyle or five sessions of a control group therapy.
Results: Both psychopathological severity (i.e. the brief psychiatric rating scale) and lifestyle quality (i.e. physical activity, sleep quality and adherence to the Mediterranean diet) improved significantly over time in patients who underwent specific psychoeducational sessions but not in the controls.
Conclusions: These findings add to the accumulating evidence that educational interventions focused on lifestyle habits can ameliorate general and mental health in patients with psychiatric disorders and suggest that educational programs represent an effective non-pharmacological intervention to manage drug-induced cardiometabolic disturbances.

Keywords

Lifestyle intervention, psychoeducation, Mediterranean diet

History

Received 27 August 2016
Revised 9 December 2016
Accepted 8 February 2017
Published online 27 February 2017

Introduction

Patients with psychiatric disorders, in particular with psychotic and mood disorders, incur a risk of morbidity and mortality markedly higher than the general population (Demyttenaere et al., 2004; Harris & Barraclough, 1998; Happell et al., 2016). In particular, the higher prevalence of cardiovascular risk factors and weight gain may largely contribute to a significant reduction in life expectancy and overall morbidity and mortality in these patients (Demyttenaere et al., 2004; Harris & Barraclough 1998; Happell et al., 2016).

The increased rate of cardio-metabolic disturbances in patients with psychiatric disorders is the resultant of a complex interplay between different factors including lifestyle related factors (e.g. poor dietary habits, altered sleep patterns, reduced physical exercise, smoking, and alcohol/drug abuse), side effects of certain psychiatric medications (e.g. atypical antipsychotics and mood stabilizers), and underlying physiological mechanisms (Balhara, 2011; Bersani, 2012; De Hert et al., 2011; Osborn, 2001). Of relevance, most of the lifestyle-related risk factors are modifiable and not specifically associated to a diagnostic category, being expressed across the whole spectrum of psychiatric disorders; indeed, poor dietary habits, reduced physical exercise, smoking and alcohol/drug abuse often characterize patients with psychotic, mood, anxiety and personality disorders (Balhara, 2011; De Hert et al., 2011; Osborn, 2001). Further, several psychiatric disorders are associated with a state of chronic generalized inflammation *per se*, with the psychiatric and inflammatory conditions negatively mutually influencing each other (Berk et al., 2013; Bersani et al., 2016a,b; Carlone et al., 2015; Halaris & Leonard, 2013; Lindqvist et al., 2017a,b; Najjar et al., 2013).

In addition to their negative impact on general health, mounting evidence suggests that cardio-metabolic disturbances may have a negative influence on core clinical outcomes of the psychiatric disorders (Balhara, 2011; Bersani et al., 2015; De Hert et al., 2011; Halaris & Leonard, 2013; Osborn, 2001). For instance, weight gain,

Correspondence: Francesco Saverio Bersani, Department of Neurology and Psychiatry, Sapienza University of Rome, Viale dell'Università 30, 00185, Rome, Italy. Fax: +39 0649915484. E-mail: bersani.fs@gmail.com

lipid, glucose, and blood pressure abnormalities have been associated with poor cognitive and functional outcomes in psychotic and mood disorders (Balhara, 2011; De Hert et al., 2011; Halaris & Leonard, 2013; Osborn, 2001).

Psychoeducational interventions are widely used in psychiatry (Goracci et al., 2016; Maiera, 2012; Martino et al., 2014; Stafford & Colom, 2013). As suggested by previous evidence on educational lifestyle interventions (Alvarez-Jimenez et al., 2008; Goracci et al., 2016; Lovell et al., 2014), it is possible to hypothesize that training programs aimed at ameliorating those poor behavioural habits associated with increased cardiovascular risk may have a positive effects on both general and mental health in the whole spectrum of psychiatric disturbances. However, despite the documented benefits of healthy lifestyle, these factors received little considerations in psychiatric treatments, where medication and psychological interventions remain the first-line treatment (Goracci et al., 2016; Sarris et al., 2014). In particular, studies exploring the impact of lifestyle modification involving multiple lifestyle elements are scanty.

The aim of the present study was to evaluate the effectiveness of an educational intervention targeting lifestyle habits on clinically-stable psychopharmacologically-treated patients with mood and psychotic disorders. We specifically addressed the impact on general and mental health of sedentary lifestyle, poor dietary habits, aberrant sleep patterns and voluptuary habits (i.e. smoking and drug/alcohol abuse). Our hypothesis was that patients who undergo the educational interventions would ameliorate in measures of both lifestyle quality and psychopathological severity.

Methods

Participants and study design

Subjects ($n = 32$) were consecutively recruited at the Day Hospital of our Psychiatric Department. The inclusion criteria for the study were (I) 18–65 years of age; (II) a diagnosis of Schizophrenia (SCZ), Bipolar Disorder (BD) or Major Depressive Disorder (MDD) as determined by the Structured Clinical Interview for DSM-IV (SCID; First, 1997); (III) patients considered clinically stable by their treating physician; (IV) patients being on a stable dose of their psychotropic medications for at least 4 weeks prior to entering the study; and (V) patients being able to grant informed consent and to follow the study procedures. Patients were not included in the study if they: (I) had a DSM-IV history of substance abuse or dependence in the 6-months prior to enrolling in the study; (II) had a concomitant, major and unstable medical, or neurologic illness; (III) had comorbid axis I or axis II diagnoses (assessed through SCID interview) other than SCZ, MDD and BD.

The institutional review board of our institution approved the study. All subjects provided written, informed consent prior to commencing their involvement in the trial.

Following completion of baseline clinical assessments, patients were randomly assigned to receive in addition to the pharmacological treatment either (i) five sessions, on a weekly basis, of group psychoeducation focused on healthy lifestyle (i.e. the intervention group – IG; $n = 16$), or (ii) five sessions, on a weekly basis, of a control group therapy (i.e. the control group – CG; $n = 16$). The study had a double-blind design: clinical ratters were not aware of subjects' group allocation and patients were blind to experimental or control group allocation.

Participants underwent clinical assessments on Monday of the first week (T0) and on Friday of the fifth week (T1), with the group sessions being delivered on a weekly basis on Wednesday. The Pittsburgh Sleep Quality Index (PSQUI) was used to assess sleep quality (Curcio et al., 2013). The PSQI is a self-administered questionnaire that assesses sleep quality and disturbances over a 30-day period. It consists of 19 self-rated questions grouped into seven clinically derived domains of sleep difficulties (sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction). The seven subcomponents correspond to specific dimensions related to sleep quality that are generally assessed in clinical practice. Each domain is rated equally on a Likert scale that ranges from 0 to 3 and is used to generate a global score of 0–21; global PSQI scores >5 indicate poor overall sleep quality (Curcio et al., 2013; Minichino et al., 2014). Physical activity was assessed through International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003). The IPAQ is a self-report measure rating the number of minutes spent exercising per day in the previous week, and the intensity level of the exercise. Metabolic equivalents are calculated by weighting minutes by 8, 4 and 3.3 for vigorous, moderate and walking intensities, respectively, and summing to produce a total score. Adherence to the Mediterranean Diet was evaluated by a using a previously validated 14-item questionnaire (QUMDA) (Martínez-González et al., 2012); each item was assigned a score of 0 or 1, with a total score ranging from 0 to 14 and a higher score indicating a higher adherence. Levels of psychopathology were assessed through the brief psychiatric rating scale (BPRS) (Overall & Gorham, 1962). The BPRS is an extensively-validated clinician-rated scale developed to evaluate the overall psychiatric status of a patient. The scale consists of items addressing different psychiatric domains being rated on a 7-point Likert scale (Overall & Gorham, 1962).

Group psychoeducation on healthy lifestyle

The psychoeducational intervention comprised five sessions delivered weekly to groups of eight patients on the following topics: (i) the importance of a regular sleep for physical and mental health, (ii) the importance of appropriate levels of physical activity for physical and mental health, (iii) the Mediterranean Diet and its potential role in improving physical and mental health (part 1), (iv) the Mediterranean Diet and its potential role in improving physical and mental health (part 2), and (v) the consequences of voluptuary habits (i.e. use of alcohol, drugs and cigarettes) on physical and mental health. Each session comprised: (i) A 20–30 min summary of the topic of the previous week with a discussion on how participants had tried to modulate that habit during the previous week, (ii) a 30–40 min presentation on the topic of the day, (iii) a 20–30 min group discussion on the topic of the day. At the end of each session subjects were offered a booklet summarizing the information given and were

Table 1. Participants' clinical and sociodemographic characteristics.

	Intervention group ($N = 16$)	Control group ($N = 16$)	Mann–Whitney U-test (p)	X^2 (p)
Age (mean ± SD)	52.56 ± 13.74	52.00 ± 13.44	0.748	
Sex (males/females; n)	8/8	8/8		1.000
Years of education (mean ± SD)	10.88 ± 3.59	9.75 ± 4.40	0.506	
BMI (mean ± SD)	25.75 ± 5.26	27.37 ± 4.00	0.327	
Diagnosis (SCZ/BD/MDD; n)	7/6/3	7/2/7		0.165
Disease duration (years; mean ± SD)	17.19 ± 11.79	13.94 ± 12.88	0.335	
Taking antidepressants (n)	5	3		0.673
Taking antipsychotics (n)	11	10		0.194
Taking mood stabilizers (n)	8	8		0.340
Taking benzodiazepines (n)	5	6		0.305
BPRS T0 (mean ± SD)	40.88 ± 9.09	38.44 ± 8.91	0.706	
IPAQ T0 (mean ± SD)	1316.89 ± 1356.91	1244.75 ± 721.96	0.607	
PSQUI T0 (mean ± SD)	10.06 ± 3.94	12.25 ± 4.11	0.137	
QUMDA T0 (mean ± SD)	7.69 ± 1.66	7.125 ± 1.41	0.239	
BPRS T1 (mean ± SD)	28.29 ± 6.38	36.63 ± 7.43	0.006*	
IPAQ T1 (mean ± SD)	1339.00 ± 1252.93	1209.75 ± 699.39	0.762	
PSQUI T1 (mean ± SD)	8.69 ± 3.36	12.13 ± 4.09	0.011*	
QUMDA T1 (mean ± SD)	8.75 ± 1.81	6.81 ± 1.55	0.005*	

*$p < 0.05$.

SD: Standard Deviation; BMI: Body Mass Index; SCZ: Schizophrenia; BD: Bipolar Disorder; MDD: Major Depressive Disorder; BPRS: Brief Psychiatric Rating Scale; IPAQ: International Physical Activity Questionnaire; PSQUI: Pittsburgh Sleep Quality Index; QUMDA: Questionnaire of Mediterranean Diet Adherence.

encouraged to take note of their thoughts/behaviors/difficulties/efforts related to the topic of the day during the following week. The overall objective of this intervention, based on previously published evidence (Goracci et al., 2016), was to help patients to develop and maintain a healthy and active lifestyle.

The control group intervention was planned to control for the nonspecific aspects of psychoeducational group sessions. The control intervention comprised five sessions delivered weekly to groups of eight patients in which patients discussed their clinical outcomes or watched and discussed a movie or received educational information on their pharmacological therapy.

Statistical analyses

The Statistical Package for the Social Sciences (SPSS, IBM Corp., Armonk, NY) was used for statistical calculations. All tests were two-tailed with an alpha = 0.05. Data are expressed as means ± standard deviation (SD). The Mann–Whitney U test for continuous variables or the chi-squared test (χ^2) for dichotomous variables were used for the between-groups comparison (IG vs CG). The Wilcoxon Sign Test was used for within-groups comparisons (T0 vs T1). Non-parametric tests were chosen due to the small sample size and the non-normal distribution of data (Farina et al., 2015; Rapinesi et al., 2015).

Results

The two groups (IG and CG) did not significantly differ in psychiatric diagnosis (seven subjects with SCZ, six subjects with BD and three subjects with MDD in the IG, seven subjects with SCZ, two subjects with BD and seven subjects with MDD in the CG), body mass index (BMI), gender, age, years of education, disease duration, pharmacological treatment. None of the subjects was experiencing acute psychosis during the study. At T0 the values of the clinical assessment scales BPRS (IG: 40.88 ± 9.09; CG: 38.44 ± 8.91; $p = 0.706$), PSQUI (IG: 10.06 ± 3.94; CG: 12.25 ± 4.11; $p = 0.137$), IPAQ (IG: 1316.89 ± 1356.91; CG: 1244.75 ± 721.96; $p = 0.607$) and QUMDA (IG: 7.69 ± 1.66; CG: 7.125 ± 1.41; $p = 0.239$) did not significantly differ between group. At T1, IG subjects compared CG subjects had significantly lower scores of BPRS (IG: 28.29 ± 6.38; CG: 36.63 ± 7.43; $p = 0.006$) and PSQUI (IG: 8.69 ± 3.36; CG: 12.13 ± 4.09; $p = 0.011$), significantly higher scores of QUMDA (IG: 8.75 ± 1.81; CG: 6.81 ± 1.55; $p = 0.005$) and similar scores of IPAQ (IG: 1339.00 ± 1252.93; CG: 1209.75 ± 699.39; $p = 0.762$). Details are given in Table 1 and Figure 1.

Within-group analyses showed that in the IG subjects the scores of BPRS ($p = 0.001$), PSQUI ($p = 0.011$), IPAQ ($p = 0.028$) and QUMDA ($p = 0.005$) changed significantly from baseline to T1, while in the CG subjects the scores of the clinical assessments did not change significantly over time. Details are given in Table 2.

Discussion

The results of the present controlled study showed that the severity of psychiatric symptomatology and the measures of lifestyle quality (physical activity, sleep quality, and adherence to the Mediterranean diet) improved significantly over time in patients who underwent specific psychoeducational sessions but not in the controls.

The measures of psychopathology (i.e. BPRS) and the measures of lifestyle (i.e. PSQUI, IPAQ and QUMDA) were assessed at the same timepoints, therefore we cannot determine causal relationships between the changes over time of these domains. However, taking into consideration that (I) the psychopharmacological intervention remained unchanged during the protocol, and (II) the psychoeducational program was specifically focused on improving healthy lifestyle skills, we hypothesize that in the present study the improvements in lifestyle may have facilitated the improvements in psychopathology, and not *viceversa.* This would be consistent with

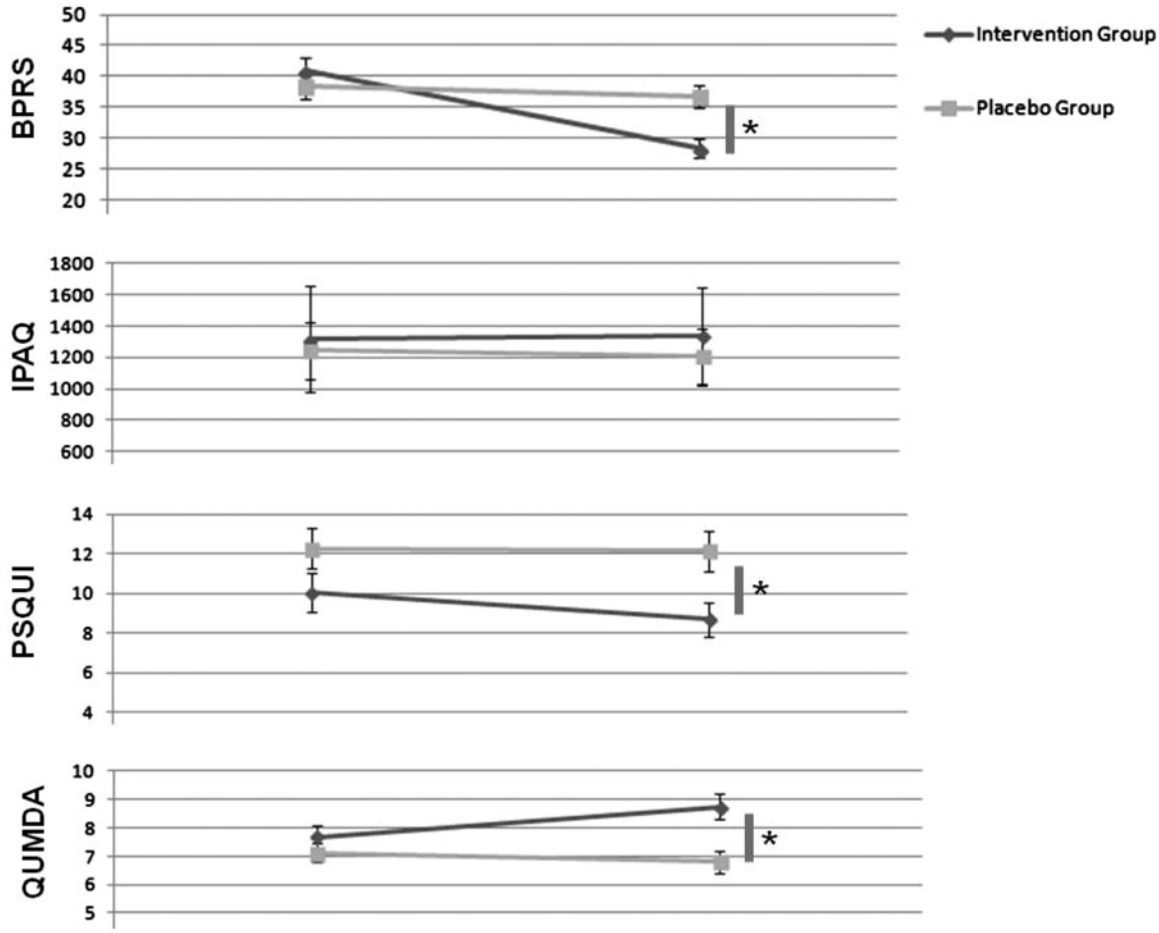

Figure 1. Changes from T0 to T1 in Brief Psychiatric Rating Scale (BPRS), International Physical Activity Questionnaire (IPAQ), Pittsburgh Sleep Quality Index (PSQUI) and Questionnaire of Mediterranean Diet Adherence (QUMDA). *$p < 0.05$. Bars represent standard error.

Table 2. Within-group changes from T0 to T1.

	Intervention group ($N = 16$)	Control group ($N = 16$)
BPRS		
T0 (mean ± SD)	40.88 ± 9.09	38.44 ± 8.91
T1 (mean ± SD)	28.29 ± 6.38	36.63 ± 7.43
Wilcoxon-*Z* test (*p* value)	0.001*	0.066
IPAQ		
T0 (mean ± SD)	1316.89 ± 1356.91	1244.75 ± 721.96
T1 (mean ± SD)	1339.00 ± 1252.93	1209.75 ± 699.39
Wilcoxon-*Z* test (*p* value)	0.028*	0.180
PSQUI		
T0 (mean ± SD)	10.06 ± 3.94	12.25 ± 4.11
T1 (mean ± SD)	8.69 ± 3.36	12.13 ± 4.09
Wilcoxon-*Z* test (*p* value)	0.011*	0.527
QUMDA		
T0 (mean ± SD)	7.687 ± 1.662	7.125 ± 1.408
T1 (mean ± SD)	8.75 ± 1.81	6.81 ± 1.55
Wilcoxon-*Z* test (*p* value)	0.005*	0.132

*$p < 0.05$.

SD: Standard Deviation; BPRS: Brief Psychiatric Rating Scale; IPAQ: International Physical Activity Questionnaire; PSQUI: Pittsburgh Sleep Quality Index; QUMDA: Questionnaire of Mediterranean Diet Adherence.

previous evidence indicating that Mediterranean-style diet (i.e. diet with high content of fibers, omega-3, olive oil, fruits, vegetables, legumes, unrefined grains and low content of saturated fat) and physical exercise can exert protective effects on neuropsychiatric diseases (Anderson & Shivakumar, 2013; Chapman et al., 2016; Goracci et al., 2016; Lai et al., 2014; Preedy & Watson, 2014; Psaltopoulou et al., 2013; Salmon, 2001).

There is a heuristic theoretical framework explaining why the modern lifestyle may be impacting mental health. Low physical exercise, poor diet, poor/decreased sleep, may potentially disrupt the hypothalamic pituitary adrenal axis leading to increased cortisol, increased low-grade systemic inflammation and oxidative stress and increased neurodegeneration (Sarris et al., 2014). Disruption of neuroendocrine function, neurogenesis and inflammation and have been linked to the etiology of a wide range of psychiatric disorders (Sarris et al., 2014).

Limitations of the study include (i) the small sample size, which makes difficult to determine the effectiveness of the intervention in each separate diagnosis, (ii) the short duration of the intervention, which makes difficult to determine the actual duration of the effectiveness of the intervention over time, and (iii) the lack of biological markers of metabolism, which makes difficult to clearly assess the impact of the protocol on cardio-metabolic disturbances. Among the strengths of the study, (i) the research was conducted with a longitudinal double-blind controlled design, and (ii) patients' pharmacological maintenance therapies remained unchanged during the study, allowing us to more specifically account for the effects of the psychoeducational intervention. An additional strength is that the enrolled patients had different

psychiatric disorders (Table 1). This suggests that the biological mechanisms underlying lifestyle-related psychiatric improvements are not specifically related to one single DSM-defined psychiatric disorder, but rather may represent common trans-diagnostic psychopathological features. In this context, we find potential in the recently developed research domain criteria (RDoC) (Insel et al., 2010) and believe that future studies should further investigate a trans-diagnostic RDoC-like approach for lifestyle interventions in mental health.

In conclusion, these findings add to the accumulating evidence that educational interventions focused on healthy lifestyle can ameliorate general and mental health in patients with psychiatric disorders and suggest that educational programs can represent a plausible add-on intervention to decrease the risk of cardiometabolic disturbances.

Declaration of interest

All authors have no affiliations or financial involvement with any organization or entity with a financial interest in the discussed subject/materials.

References

Alvarez-Jimenez M, Hetrick SE, Gonzalez-Blanch C, et al. (2008). Non-pharmacological management of antipsychotic-induced weight gain: systematic review and meta-analysis of randomised controlled trials. Br J Psychiatry, 193, 101–7.

Anderson E, Shivakumar G. (2013). Effects of exercise and physical activity on anxiety. Front Psychiatry, 4, 27.

Balhara YP. (2011). Diabetes and psychiatric disorders. Indian J Endocrinol Metab, 15, 274–83.

Berk M, Williams LJ, Jacka FN, et al. (2013). So depression is an inflammatory disease, but where does the inflammation come from? BMC Med, 11, 200.

Bersani FS, Iannitelli A, Pacitti F, Bersani G. (2012). Sleep and biorhythm disturbances in schizophrenia, mood and anxiety disorders: A review. Riv Psichiatr, 47, 365–75.

Bersani FS, Coviello M, Imperatori C, et al. (2015). Adverse psychiatric effects associated with herbal weight-loss products. Biomed Res Int, 2015, 120679.

Bersani FS, Wolkowitz OM, Lindqvist D, et al. (2016a). Global arginine bioavailability, a marker of nitric oxide synthetic capacity, is decreased in PTSD and correlated with symptom severity and markers of inflammation. Brain Behav Immun, 52, 153–60.

Bersani FS, Wolkowitz OM, Milush JM, et al. (2016b). A population of atypical CD56CD16 Natural Killer cells is expanded in PTSD and is associated with symptom severity. Brain Behav Immun, 56, 264–70.

Carlone C, Rusconi AC, Valeriani G, et al. (2015). Osteoporosis and major depression: Open debate on a bidirectional relationship. Riv Psichiatr, 50, 161–7.

Chapman JJ, Fraser SJ, Brown WJ, Burton NW. (2016). Physical activity preferences, motivators, barriers and attitudes of adults with mental illness. J Ment Health, 6, 1–7.

Craig CL, Marshall AL, Sjöström M, et al. (2003). International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc, 35, 1381–95.

Curcio G, Tempesta D, Scarlata S, et al. (2013). Validity of the Italian version of the Pittsburgh Sleep Quality Index (PSQI). Neurol Sci, 34, 511–9.

De Hert M, Correll CU, Bobes J, et al. (2011). Physical illness in patients with severe mental disorders. I. Prevalence, impact of medications and disparities in health care. World Psychiatry, 10, 52–77.

Demyttenaere K, Bruffaerts R, Posada-Villa J, et al. (2004). Prevalence, severity, and unmet need for treatment of mental disorders in the World Health Organization World Mental Health Surveys. JAMA, 291, 2581–90.

Farina B, Speranza AM, Imperatori C, et al. (2015). Change in heart rate variability after the adult attachment interview in dissociative patients. J Trauma Dissociation, 16, 170–80.

First MB. (1997). Structured clinical interview for DSM-IV axis I disorders. Washington (DC): American Psychiatric Press.

Goracci A, Rucci P, Forgione RN, et al. (2016). Development, acceptability and efficacy of a standardized healthy lifestyle intervention in recurrent depression. J Affect Disord, 196, 20–31.

Halaris A, Leonard BE. (2013). Inflammation in psychiatry. Basel: Karger.

Happell B, Wilson K, Platania-Phung C, Stanton R. (2016). Physical health and mental illness: listening to the voice of careers. J Ment Health, 22, 1–7.

Harris EC, Barraclough B. (1998). Excess mortality of mental disorder. Br J Psychiatry, 173, 11–53.

Insel T, Cuthbert B, Garvey M, et al. (2010). Research domain criteria (RDoC): Toward a new classification framework for research on mental disorders. Am J Psychiatry, 167, 748–51.

Lai JS, Hiles S, Bisquera A, et al. (2014). A systematic review and meta-analysis of dietary patterns and depression in community-dwelling adults. Am J Clin Nutr, 99, 181–97.

Lindqvist D, Dhabhar FS, James SJ, et al. (2017a). Oxidative stress, inflammation and treatment response in major depression. Psychoneuroendocrinology, 76, 197–205.

Lindqvist D, Dhabhar FS, Mellon SH, et al. (2017b). Increased pro-inflammatory milieu in combat related PTSD - A new cohort replication study. Brain Behav Immun, 59, 260–4.

Lovell K, Wearden A, Bradshaw T, et al. (2014). An exploratory randomized controlled study of a healthy living intervention in early intervention services for psychosis: The INTERvention to encourage ACTivity, improve diet, and reduce weight gain (INTERACT) study. J Clin Psychiatry, 75, 498–505.

Maiera E. (2012). Psychopharmacological treatment and psychoeducational management in bipolar disease. Psychiatr Danub, 24, S56–8.

Martínez-González MA, García-Arellano A, Toledo E, et al. (2012). A 14-item Mediterranean diet assessment tool and obesity indexes among high-risk subjects: The PREDIMED trial. PLoS One, 7, e43134.

Martino F, Lia L, Bortolotti B, et al. (2014). The family of a patient with borderline personality disorder: Burden of illness and interventions for caregivers. Riv Psichiatr, 49, 199–206.

Minichino A, Bersani FS, Spagnoli F, et al. (2014). Prefronto-cerebellar transcranial direct current stimulation improves sleep quality in euthymic bipolar patients: A brief report. Behav Neurol, 2014, 876521.

Najjar S, Pearlman DM, Alper K, et al. (2013). Neuroinflammation and psychiatric illness. J Neuroinflammation, 10, 43.

Osborn DP. (2001). The poor physical health of people with mental illness. West J Med, 175, 329–32.

Overall JE, Gorham DR. (1962). The brief psychiatric rating scale. Psychological Reports.

Preedy VR, Watson RR. (2014). The Mediterranean diet, an evidence-based approach. Amsterdam: Elsevier.

Psaltopoulou T, Sergentanis TN, Panagiotakos DB, et al. (2013). Mediterranean diet, stroke, cognitive impairment, and depression: A meta-analysis. Ann Neurol, 74, 580–91.

Rapinesi C, Bersani FS, Kotzalidis GD, et al. (2015). Maintenance deep transcranial magnetic stimulation sessions are associated with reduced depressive relapses in patients with unipolar or bipolar depression. Front Neurol, 6, 16.

Salmon P. (2001). Effects of physical exercise on anxiety, depression, and sensitivity to stress: A unifying theory. Clin Psychol Rev, 21, 33–61.

Sarris J, O'Neil A, Coulson CE, et al. (2014). Lifestyle medicine for depression. BMC Psychiatry, 14, 107.

Stafford N, Colom F. (2013). Purpose and effectiveness of psychoeducation in patients with bipolar disorder in a bipolar clinic setting. Acta Psychiatr Scand Suppl, 2013, 11–18.