Thesis

FEASIBILITY OF THE NUTRIMENTAL SCREENER

submitted by

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Graz, am 20.01.2025 Benedikt Hemler m.p.

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Zusammenfassung auf Deutsch

Einleitung: Schwere psychische Erkrankungen gehen häufig mit komplexen Ernährungsproblemen einher, einschließlich gestörtem Essverhalten und metabolischen Komplikationen durch Psychopharmaka. Obwohl der Einfluss der Ernährung auf die psychische Gesundheit nachgewiesen ist, gibt es nur wenige Instrumente für das Ernährungsscreening in psychiatrischen Einrichtungen. Diese Studie evaluiert die Durchführbarkeit und Akzeptanz des NutriMental Screeners, eines neuartigen Instruments, mit dem ernährungsbedingte Risiken bei Patienten*innen mit psychischen Störungen erkannt und eine frühzeitige diätologische Intervention erleichtert werden soll.

Methoden: Es wurde eine Pilotstudie zur Durchführbarkeit mit 23 Teilnehmer*innen (19 stationäre und vier ambulante Patient*innen) an der Klinik für Psychiatrie des LKH Graz durchgeführt. Die Kliniker*innen nutzten den NutriMental Screener, um den Ernährungszustand, Verhaltensweisen und die damit verbundenen Risiken der Patient*innen zu beurteilen. Die Rückmeldungen zur Anwendbarkeit und Wirksamkeit des Instruments wurden von den Kliniker*innen mittels strukturierter Fragebögen eingeholt, während die Patient*innendaten, einschließlich BMI, Gewichtsveränderungen und Anfragen nach Ernährungsberatung, analysiert wurden.

Ergebnisse: Der NutriMental Screener erwies sich als sehr benutzerfreundlich, da 96 % der Ausfüllvorgänge weniger als fünf Minuten in Anspruch nahmen. Die Benutzer*innenfreundlichkeit wurde vom klinischen Personal in 96 % der Fälle als „sehr einfach“ oder „einfach“ bewertet. Von den Patient*innen baten 47 % um Ernährungsberatung. Die Empfehlungen der Kliniker*innen für eine diätetische Unterstützung führten bei 57 % der Patient*innen zu einer Überweisung. Zu den häufigsten somatischen Komorbiditäten gehörten Stoffwechselstörungen, Magen-Darm-Probleme und Essstörungen.

Diskussion: Der NutriMental Screener hat sich als praktikables und benutzerfreundliches Instrument in der psychiatrischen Versorgung erwiesen, mit dem sich Ernährungsrisiken wirksam erkennen und Überweisungen veranlassen ließen. Herausforderungen wie die Rekrutierung und Adhärenz von Kliniker*innen verdeutlichen jedoch die Notwendigkeit einer weiteren Optimierung. Die Pilotstudie zeigte auch Lücken bei der Beantwortung von Patient*innenenanfragen zur Ernährungsunterstützung auf, was die begrenzten Ressourcen in psychiatrischen Einrichtungen verdeutlicht.

Diese Studie bestätigt die Durchführbarkeit des NutriMental Screeners in der psychiatrischen Routinepraxis und bietet einen praktischen Ansatz für die Berücksichtigung der

Ernährungsbedürfnisse von Menschen mit psychischen Störungen. Zukünftige Forschung sollte sich auf eine groß angelegte Validierung und Integrationsstrategien konzentrieren, um den klinischen Nutzen zu erhöhen und die Ergebnisse für die Patient*innen zu verbessern.

Abstract in Englisch

Introduction: Severe mental illnesses (SMIs) often co-occur with complex nutritional challenges, including disordered eating and metabolic complications from psychotropic medications. Despite evidence highlighting the impact of nutrition on mental health, existing tools for nutrition screening in psychiatric settings are limited. This study evaluates the feasibility and acceptability of the NutriMental Screener, a novel instrument designed to identify nutrition-related risks among patients with SMIs and facilitate early intervention.

Methods: A pilot feasibility study was conducted at a psychiatric institution with 23 participants (19 inpatients and four outpatients). Clinicians used the NutriMental Screener to assess patients' nutritional status, behaviours, and associated risks. Feedback on the tool's usability and effectiveness was collected from clinicians through structured questionnaires, while patient data, including BMI, weight changes, and requests for nutritional advice, were analysed.

Results: The NutriMental Screener demonstrated high usability, with 96% of completions taking less than 5 minutes. Clinicians rated ease of use as "very easy" or "easy" in 96% of cases. Among patients, 43% reported significant weight changes, and 47% requested nutritional advice. Clinician recommendations for dietetic support led to referrals for 57% of patients. Common comorbidities included metabolic disorders, gastrointestinal (GI) issues and eating disorders.

Discussion: The NutriMental Screener showed promise as a feasible and user-friendly tool in psychiatric care, effectively identifying nutritional risks and guiding referrals. However, clinician recruitment and adherence challenges highlight the need for further optimisation. The pilot study also revealed gaps in addressing patient requests for dietary support, underscoring resource limitations in psychiatric settings.

This pilot study confirms the feasibility of the NutriMental Screener in routine psychiatric practice, offering a practical approach to addressing the nutritional needs of individuals with SMIs. Future research should focus on large-scale validation and integration strategies to enhance its clinical utility and improve patient outcomes.

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Glossary and Abbreviations

Abbreviation	Expanded Form
ACE	Angiotensin-converting enzyme
AN	Anorexia nervosa
ARFID	Avoidant-restrictive food intake disorder
ASC-SR	Approaches to Schizophrenia Self Report
BD	Bipolar Disorder
BED	Binge eating disorder
BIA	Bioelectrical Impedance Analysis
BMI	Body Mass Index
BN	Bulimia nervosa
CANMAT	Canadian Network for Mood and Anxiety Treatments
CT	Computed Tomography
DGPPN	Deutsche Gesellschaft für Psychiatrie und Psychotherapie, Psychosomatik und Nervenheilkunde
DHA	Docosahexaenoic Acid
DSM	Diagnostic and Statistical Manual of Mental Disorders
DXA	Dual-energy X-ray Absorptiometry
EPA	Eicosapentaenoic Acid
GABA	Gamma-Aminobutyric Acid
GI	Gastrointestinal
HDL	High-density lipoprotein
HPA	Hypothalamic-Pituitary-Adrenal Axis
HRQoL	Health-Related Quality of Life
IBS	Irritable Bowel Syndrome
ICD	International Statistical Classification of Diseases and Related Health Problems
IO&NS	Inflammatory and oxidative and nitrosative stress
IQR	Interquartile Range
MDD	Major Depressive Disorder
MRI	Magnetic Resonance Imaging
n	Sample size (statistics)
NAC	N-acetyl cystein
OR	Odds ratio
p	p-value, statistical significance
PUFAs	Polyunsaturated fatty acids
SAMe	S-Adenosyl methionine
SANSI	St Andrew's Nutrition Screening Instrument
SCFA	Short-chain fatty acids
SCZ	Schizophrenia
SGAs	Second-Generation Antipsychotics
SMI	Severe Mental Illness
SNRI	Serotonin-Norepinephrine Reuptake Inhibitors

SSRI	Selective Serotonin Reuptake Inhibitors
WCYC	Weight Cycling
WFSBP	World Federation of Societies of Biological Psychiatry

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1 Introduction

1.1 Background

Nutritional screening in hospitals is part of routine clinical care to identify 'at risk' patients and enable intervention by specialist clinicians. People in hospital settings other than psychiatry are often recovering from injury or physical illness, which results in increased protein and calorie requirements and possibly decreased appetite, leading to high rates of malnutrition (1). The needs and priorities of people with severe mental illness (hereafter SMI), such as major depressive disorder (MDD), bipolar disorder (BD), schizophrenia (SCZ) and related psychoses in mental health care, differ significantly from those in other health care settings. Unlike other hospital settings**,** people with psychiatric disorders are not recovering from a physical illness that involves increased protein and energy requirements but, as study findings show, have lower nutritional requirements due to a lower metabolic rate (2). Furthermore, treatment usually consists of taking psychotropic drugs, especially second-generation antipsychotics (SGAs) and mood-stabilising drugs, which increase appetite (3) and increase the risk of disordered eating behaviour such as binge eating (4). In addition to medication, there is evidence of complex associations between mental illness, disordered eating behaviour and eating disorders (5, 6). Furthermore, unhealthy eating styles, such as emotional eating have been linked to mental illness (7, 8).

A systematic review and meta-analysis published in 2019 examined dietary intake in people with BD, SCZ and related psychoses (9). This review found higher calorie and sodium intake compared to people without mental illness. In addition, it was found that the diet often did not meet the guidelines for nutrition and was frequently of lower quality than for people without mental illness or the general population. In many cases, the diets of people with mental illness were characterised by a higher intake of high-calorie, low-nutrient foods and a lower intake of fruit, vegetables and fish (9).

These eating habits are associated with and likely exacerbate the side effects of psychotropic medication, with average individual weight gain ranging from 4.4 kg (aripiprazole) to 8.5 kg (olanzapine) in the first 12 weeks of treatment (10), increasing to an average of 19 kg after four years (11). The weight gain seems to continue in the long term and, as a large cohort study shows, persists throughout the observation period of 20 years (12). In addition, antipsychotic drugs often lead to metabolic abnormalities such as increased blood

glucose and blood lipid levels (13). These characteristics and other common problems, such as high levels of physical inactivity (14), high rates of smoking (15) and substance abuse (16), have led to significant health disparities in people with mental illness. Compared to people without mental illness, people with SMI have a higher risk of developing abdominal obesity (odds ratio [OR] 4.43), hypertriglyceridemia (OR 2.73), metabolic syndrome (OR 2.35), low high-density lipoprotein (HDL) (OR 2.35), diabetes (OR 1.99) and hypertension (OR 1.36) (17). Concomitant physical illnesses are the leading cause of the 10 to 16 years shorter life expectancy compared to people without mental illness (17).

Somatic healthcare is often neglected in mental health settings, with co-occurring physical illnesses remaining undiagnosed in patients with mental illness than in those without mental illness (18). One possible reason for this is diagnostic overlay, a process in which physical symptoms are mistakenly attributed to mental illness (19). In addition, psychiatrists and psychiatric nurses are not sufficiently informed about the somatic comorbidities and metabolic monitoring procedures in their patients with mental illness (20, 21) and have little or no training in nutritional topics (21). This results in a lower uptake of general prevention and specialised routine somatic care among people with SMI compared to the general population (22).

One method to reduce this gap is to target referrals of patients in mental health facilities to specific clinicians, e.g., referral to dieticians when a patient is at risk of over- or under-nutrition. A recent review of nutrition screening tools used in mental health settings found a lack of targeted and adequately validated tools (23). The Approaches to Schizophrenia Communication Self-Report (ASC-SR) was the only screening method identified for the risk of over- and undernutrition in people with mental health problems, especially SCZ. Still, it focuses only on the side effects of antipsychotic treatment (24). Another promising screening tool is the St Andrew's Nutrition Screening Instrument (SANSI), which was developed specifically for use in an inpatient secure psychiatric facility and has had limited reliability and validity testing (25).

Due to a lack of suitable screening instruments, an international working group developed a protocol for developing and validating a nutritional screening tool for people with mental illness (27), the development of which is divided into 5 phases (Figure 1, p.25). Phases 1-3

have already been completed. This study aims to test the feasibility and acceptability of the NutriMental Screening Tool (Phase 4, Feasibility Studies) (26).
This targeted nutrition screening tool aims to identify people with mental illness who have possible nutritional risks, including over- and undernutrition. Early detection is intended to provide and enable early referral to an assessment by a specialist clinician, such as a dietitian.
To understand the research screener's core, it is important to define key points and topics.

1.2 The Pathogenesis of Severe/Serious Mental Illness

SMI, such as SCZ, BD, and MDD, are of a complex and multicausal nature. All the above-mentioned disorders are polyetiological in their development, involving genetic, neurobiological, environmental, and psychological factors. The major theories underlying their aetiology are the vulnerability-stress model and several hypotheses related to the dysregulation of specific neurotransmitters.

1.2.1 Vulnerability-Stress Model

The Vulnerability-Stress Model is a model of pathogenesis first described by Zubin & Spring (1977), suggesting that severe mental illness develops due to the interaction between an individual's inherent vulnerability and external stressors. This model incorporates both biological predispositions (vulnerability) and life experiences (stressors) and was developed to first only explain the pathogenesis of schizophrenia. It was later extended to several other SMIs, such as MDD, BD and anxiety disorders. (27, 28)

Vulnerabilities may be genetic predispositions, prenatal factors, early childhood trauma and neurobiological abnormalities contributing to an individual's vulnerability to developing an SMI.
Stressors are described as environmental triggers, such as psychological stress, major life events and substance abuse, whereby social adversity may act as a catalyst. The model emphasises that the intensity and frequency of stressors, in interaction with an individual's vulnerability, determine the likelihood of developing a mental disorder. In the last decade, protective factors have been described as much more critical than previously acknowledged. (29)

1.2.2 Neurotransmitter Hypothesis

The neurotransmitter hypotheses describe the impact of the dysregulation of different neurotransmitters in various SMIs. The main culprits identified today are dopamine and glutamate for schizophrenia, serotonin and norepinephrine for depression and gamma-aminobutyric acid (GABA)ergic dysregulation for SCZ and mood disorders.

Dopamine Hypothesis

The dopamine hypothesis for SCZ suggests an overactivity of dopaminergic pathways, particularly in the mesolimbic region, contributing to the positive symptoms of SCZ (like hallucinations and delusions). Conversely, underactivity in the prefrontal cortex (mesocortical pathway) may be related to negative and cognitive symptoms. This theory has been supported by the efficacy of antipsychotic medications, which primarily act as dopamine receptor antagonists. (30)

Serotonin and Norepinephrine Hypothesis

The serotonin and norepinephrine hypothesis for depression and MDD describes how a reduced availability or dysregulation of serotonin and norepinephrine is considered to play a key role. Conversely, antidepressant medications, including selective serotonin reuptake inhibitors (SSRIs) and serotonin-norepinephrine reuptake inhibitors (SNRIs), have substantiated this theory by enhancing the synaptic concentrations of these neurotransmitters. (31)

Glutamate Hypothesis

Another hypothesis for the pathogenesis of schizophrenia is the glutamate hypothesis. According to its first postulation in the 1980s, reduced glutamatergic activity contributes to the symptoms of schizophrenia. This theory came from observations of how NMDA receptor agonists, like ketamine, can induce schizophrenia-like symptoms in healthy adults (32, 33).

The GABAergic dysregulation hypothesis states that an imbalance in excitatory-inhibitory neurotransmission resulting from dysfunctions in the GABAergic neurons might contribute to symptoms of schizophrenia and, at the same time, lead to disruptions in neural circuitry (34).

1.3 The Biopsychosocial Model

The biopsychosocial model is a holistic model for the genesis of health and disease. Introduced by Georg L. Engel in 1977, the biopsychosocial model expanded the traditional biomedical view by integrating psychological and social aspects into understanding disease. Engel argued that health should be viewed holistically, encompassing not only biological factors but also the patient's mental state and social environment. This approach addressed the limitations of the biomedical model, which excluded psychological conditions and even led some to dismiss mental illness as non-medical. (35) Engel's model emphasised that effective diagnosis and treatment require considering the interaction between biological, psychological, and social influences (36).

The biopsychosocial model posits that nature functions as a hierarchy, where failure at any level – from subatomic particles to the person and their social environment – can influence other levels. This hierarchy extends to broader cultural and environmental contexts. While systems can act independently, they are interconnected and impact one another, meaning a disturbance at one level can affect other systems depending on circumstances. Health and disease are dynamic states requiring ongoing maintenance, and potential psychological causes must be considered in any diagnosis (37).

Applying the biopsychosocial model in clinical practice emphasises the importance of doctor-patient communication. Treatment should progress through the "word" (communication), "remedy" (medication), and finally, "knife" (surgery) approach, highlighting the need for doctors to possess not just medical expertise but also strong communication and psychotherapeutic skills (37).

Critics note that Engel’s model outlines desired outcomes but lacks details on implementation. It does not clearly explain how or why the model should be applied and lacks a unified language for mental and physical disorders (37). Additionally, the model is vague about the interaction between hierarchical levels and poses challenges in synthesising complex psychosocial and biological data, making practical application difficult (37-39).

In modern psychiatry, the biological fraction of the biopsychosocial model is mainly addressed as pharmacological interventions, which are often accompanied by a copious amount of side effects. Amongst them, the impact on the metabolism of patients is considered one of the most life-shortening (40). With this in mind, the need for additional modes

of treatment becomes more relevant. Here, the field of Nutritional Psychiatry has emerged as an additional holistic approach, providing a further tool for the explanation and treatment of mental disorders.

1.4 Nutritional Psychiatry

Given that the well-established and well-studied methods in psychiatry, like psychopharmacological interventions and psychotherapy, sometimes fail to deliver the expected results in the treatment of mental illness, other treatment options must be explored. Since its emergence, a lot has happened in this field, connecting mental health to diet, people's lifestyles and trends towards urbanisation and globalisation.

Robust evidence (41-43) suggests that poor diet is a significant risk factor for mental illnesses such as depression, anxiety and BD and, vice versa, a modification in diet and physical activity can be a viable therapeutic option in the treatment of the conditions listed above (44). Additionally, the consumption of antioxidants and use of psychobiotics, a novel class of pro- and prebiotics improving symptoms of mental illnesses via modulation of the gut-brain axis via bacterial production of serotonin and GABA, may pose viable therapeutic add-ons and show promising results. (45)

Nutritional psychiatry is a lively new discipline bridging the gap between diet and mental health. It concerns how foods and nutrients impact the brain, mood, and behaviour. Nutritional psychiatry aims to create dietary treatments for the prevention and treatment of mental disorders such as MDD, anxiety or SCZ.

Some nutrients, including omega-3 fatty acids, EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) specifically, B-vitamins, zinc, and magnesium, have been a helping addition in antidepressant and anti-anxiety therapy. Conversely, a diet rich in processed foods, sugar and saturated fat has been linked to an increased risk of depression and other mental health conditions (46, 47). In conclusion, nutritional psychiatry indicates that a whole food diet high in vegetables, whole grains, legumes and lean protein can efficaciously enhance mental health outcomes (9, 21, 26, 48).

1.4.1 The Pathophysiology of Nutrition and Mental Health

The pathophysiology of nutrition affecting mental health is complex, with diverse components such as the gut-brain axis, neurotransmitter production, inflammatory processes, and the microbiome playing a major role. Diet represents an important modifiable risk factor for psychiatric disorders since the brain has a high-energy demand and depends on a constant supply of nutrients, including amino acids, vitamins, minerals, and fatty acids, to sustain neurotransmitter balance, cellular integrity and function as well as overall brain activity (49). The role of nutrition is crucial, as it delivers the building blocks to aid in neurotransmitter production and regulation, particularly serotonin, dopamine and GABA, which are all necessary for mood and cognition. For example, the production of serotonin relies on tryptophan, a necessary amino acid derived through diet. B-vitamins, zinc, and magnesium deficiencies disrupt neurotransmitter synthesis, leading to cognitive impairment as well as mood disorders. A current hypothesis is that omega-3 fatty acids, especially EPA and DHA, modulate neurotransmission by increasing the fluidity of cellular membranes in neuronal structures. Said modulation affects receptor function and signal transduction, which may facilitate the action of antidepressant drugs or improve symptoms in depressed patients besides decreasing the severity of symptoms in SCZ (50-52).

Dietary habits also significantly influence inflammation, which is closely linked to negative impacts on mental health (53-55). Chronic inflammation can disrupt the balance of neurotransmitters and contribute to the pathogenesis of mental disorders and nutritional deficiencies, which can further lead to increased pro-inflammatory cytokine levels that can affect brain functions by altering neurotransmitters' synthesis, secretion, and reuptake. (56) Various cytokines, for example, can activate cascades that reduce the availability of serotonin and other monoamines, which can exacerbate depressive symptoms (57, 58). Mediterranean dietary patterns may pose a possible remedy for this dysregulation, as they represent nutrient-dense, anti-inflammatory diets owing to the high content of omega-3 fatty acids, antioxidants, and polyphenols, which may help to modulate inflammatory responses and protect neuronal health.

The gut-brain axis, a bidirectional communication system between the gastrointestinal (GI) tract and the central nervous system, is a core element to understanding the relationship between diet and mental health. At the core of this axis is the gut microbiome, consisting

of trillions of microorganisms and their genetic information. Diet significantly impacts the composition and function of the gut microbiota, impacting brain function (59-61). A healthy microbiome helps to provide short-chain fatty acids (SCFAs) that fight inflammation and support the blood-brain barrier to stay intact. On the other hand, a diet high in processed foods and sugars drives dysbiosis, raising intestinal permeability and releasing bacterial endotoxins that trigger inflammation throughout the body and in the brain (57, 58, 60-62). Such dysregulation can lead to an increased release of cytokines and other inflammatory mediators and enhance a "*leaky gut"*, where bacterial components can access the circulation and begin to affect the brain. The gut microbiome also takes part in neurotransmitter synthesis and metabolism, given that some bacterial strains, including *Lactobacillus* and *Bifidobacterium*, have been demonstrated to produce and modulate GABA and serotonin metabolism, which amounted to anxiolytic and antidepressant effects in animal studies. This supports the view that an adequate diet normalising gut health is crucial for mental health (57, 58, 60-62).

The relationship between neurotransmitter synthesis, inflammation, and the microbiome highlights how nutrition affects mental health. A lack of essential nutrients can hinder the production of neurotransmitters and trigger inflammatory responses (50, 52, 54), and an unhealthy gut environment may worsen these problems. Nutritional strategies that emphasise a diet high in fibre, vitamins, minerals, and healthy fats can promote a healthy microbiome, decrease inflammation, and enhance neurotransmitter function, and thus lead to lower levels of depression and anxiety because of their combined effects on these pathways (58, 63, 64).

1.4.2 Comorbidities Between Somatic and Psychiatric Illness

The relationship between psychiatric and physical illnesses is complex and each type of disorder can influence the onset or worsening of the other. This interaction has important implications for patient outcomes, healthcare usage, and treatment approaches.

1.4.2.1 Psychiatric Illness Leading to Somatic Conditions

People with SMI often experience higher rates of physical health issues. Research has consistently indicated that these individuals are at a greater risk of developing cardiovascular diseases, diabetes, metabolic syndrome, and various other chronic conditions (65, 66).

Several mechanisms explain this connection: Patients with mental disorders often engage in behaviours that increase the risk of physical illness, like a poor diet, smoking, alcohol and substance abuse, and physical inactivity (14, 15). These habits are linked to increased rates of obesity, hypertension, and other metabolic conditions (67).
The second factor explaining the comorbidities, as mentioned above, is medication side effects: Long-term use of psychotropic drugs, especially SGAs and mood stabilisers, is associated with adverse metabolic effects, including weight gain, dyslipidaemia, and insulin resistance (66, 68). This can predispose patients to type 2 diabetes and cardiovascular complications. Additionally, some barriers in healthcare systems apply, too: stigmatisation, cognitive challenges, and non-appropriately structured healthcare systems can hinder individuals with psychiatric conditions from receiving proper medical care. As a result, this often results in underdiagnosis or poor management of physical illnesses (67, 68).

1.4.2.2 Somatic Illness Leading to Psychiatric Conditions

The reverse relationship, where physical conditions contribute to the development or exacerbation of psychiatric disorders, is equally significant. Chronic physical illness causes psychological stress and can trigger or worsen mental health conditions (69).
Persistent physical health issues can lead to chronic stress, which impacts the hypothalamic-pituitary-adrenal (HPA) axis and promotes a pro-inflammatory state. Chronic inflammation is known to affect brain function and can contribute to the onset of depression and anxiety (65, 67). Furthermore, chronic conditions like diabetes and cardiovascular disease can negatively impact brain health by causing vascular changes and metabolic issues, which heighten the risk of cognitive decline and mental health disorders. For instance, diabetes has been associated with increased rates of depression, possibly due to alterations in glucose metabolism and inflammation (66, 68). In addition, the emotional strain of dealing with chronic illnesses can result in mental health challenges. For example, people suffering from painful or debilitating diseases may find their quality of life diminished, which can lead to feelings of depression and anxiety (14, 15, 65, 66).

1.5 Integrated Care and the Need for Holistic Approaches

The high rate of comorbidity between psychiatric and physical illnesses emphasises the necessity for integrated care that considers both mental and physical health. This is especially

important since comorbid conditions are frequently overlooked or not treated adequately, resulting in worse health outcomes and higher mortality rates (66, 68). Patients with disorders such as SCZ and BD not only experience increased rates of neurological and endocrinological issues but also face higher mortality from preventable physical health problems (66). In children and adolescents, having psychiatric conditions is associated with a greater risk of developing physical disorders like asthma, obesity, and GI problems. This highlights the need for early interventions that tackle psychological and physical health to avoid long-term complications (67).

In conclusion, the interconnectedness of psychiatric and somatic comorbidities highlights the importance of a holistic and comprehensive healthcare approach. By addressing lifestyle factors, enhancing treatment adherence, and ensuring coordinated care between psychiatric and medical services, the adverse effects of these comorbid conditions can be reduced and improve overall patient outcomes.

1.5.1 Metabolic Psychiatry

Another holistic approach to psychiatry is the relatively new but rapidly growing field of metabolic psychiatry. It addresses the intersection of mental health problems and metabolic disorders such as insulin resistance, excessive inflammation, metabolic syndrome and obesity. In treatment, metabolic psychiatry focuses on eliminating processed foods and refined carbohydrates and often utilises a ketogenic diet to switch to ketone-body metabolism. Even though the theories look promising, metabolic psychiatry has yet to be proven with high-quality research aside from rodent models or case reports (70, 71).

1.5.2 Integrating Nutritional Advice into Daily practice – What do the Guidelines say?

1.5.2.1 DGPPN S3 Guideline for Schizophrenia (DGPPN Leitlinie Schizophrenie, 15.03.2019; - currently under review)

The S3 guideline for SCZ (S-3 Leitlinie Schizophrenie) recommends, first and foremost, active monitoring of weight gain: Early recognition of weight gain is crucial for timely intervention. Interventions could be non-pharmacological approaches such as dietary counselling, psychoeducation, and lifestyle interventions (e.g., physical activity). Pharmacological approaches include medication adjustments such as reducing the dose or switching

antipsychotic drugs. Discontinuing treatments may be an option for managing significant weight gain, with specific alternatives like aripiprazole and ziprasidone being considered due to their lower risk of weight gain.

Evidence from meta-analyses has shown that lifestyle interventions, including dietary and cognitive behavioural therapy, can result in significant weight loss, reduction of the body mass index (BMI), and improved fasting glucose levels. Professional nutritional guidance and interventions initiated early in treatment show more potent effects.

Pharmacological add-ons like metformin and topiramate are effective add-on therapies for weight reduction when combined with antipsychotic treatment, although topiramate is not broadly recommended due to potential psychiatric side effects.

1.5.2.2 DGPPN S3 Guideline for Psychosocial Therapies in Severe Mental Illness (Leitlinie Psychosoziale Therapien bei schweren psychischen Erkrankungen 02.10.2018)

In this guideline, one of the newest additions has been a recommendation to promote balanced and healthy nutrition, not only in the framework of a somatic increase in well-being but also to promote self-management of disease and training in everyday tasks.

More detailed information regarding nutritional advice in the guideline is the following: 0.8g/kg of bodyweight protein intake per day, 50% of total calories per day should stem from carbohydrates, 30-35% from fats, and 30g of fibre/day. Also recommended is an intake of 650g of fruits and vegetables per day.

1.5.2.3 The Lancet Psychiatry Commission: a blueprint for protecting physical health in people with mental illness

This guideline from 2019 puts a focus on key components of lifestyle interventions as a major cornerstone in treating patients suffering from SMI. Considering diet and nutrition, this guideline identifies poor diet as one of the hallmarks of behavioural risk factors across different mental health diagnoses. It aims to improve diet quality and reduce body weight by working as a multidisciplinary team, including dietitians, at an early stage of treatment. The guideline also acknowledges recent findings in nutritional psychiatry (such as the link between mental illness and inflammation, dietary intake and the microbiome) and advises clinicians to devise an effective yet sustainable dietary regimen (72).

1.5.2.4 Clinical guidelines for the use of lifestyle-based mental health care in major depressive disorder: World Federation of Societies for Biological Psychiatry (WFSBP) and Australasian Society of Lifestyle Medicine (ASLM) taskforce (06.10.2022)

This guideline acknowledges the importance of dietary interventions in the treatment of MDD. It stresses that the Mediterranean diet is not the only effective form of dietary modification for a successful intervention, but any form of nutrient-rich diet that also guarantees adherence is effective. The guideline also states that more restrictive diets (vegan diet, ketogenic diet) are, in fact, not more effective in assisting treatment. Integrating joy, social connections, and mindfulness into eating experiences can enhance the overall benefits of the advised dietary approach. Individuals should seek guidance from trained dieticians to optimise their nutritional habits when needed. It is advisable to increase the intake of fruits, vegetables, legumes, whole grains, nuts, seeds, herbs, and spices as tolerated. To make healthy eating more practical and cost-effective, cooking in bulk, planning meals, and using frozen vegetables, canned or dried legumes, and tinned fish are recommended.
The guideline also recommends incorporating foods rich in omega-3 polyunsaturated fatty acids and dietary fibre as beneficial, while ultra-processed foods should be minimised. Instead, nutrient-rich, minimally processed foods should replace these items. Red meat intake should be moderated, with a preference for lean cuts over processed or fatty options, while respecting cultural and religious dietary practices. Extra virgin olive oil should be used as the primary cooking oil. Adequate daily water intake should be maintained, and excessive alcohol consumption should be avoided to support overall health and well-being. The recommendations are primarily based on Opie et al. (2017) (46).

1.5.2.5 Clinician guidelines for the treatment of psychiatric disorders with nutraceuticals and phytoceuticals: The World Federation of Societies of Biological Psychiatry (WFSBP) and Canadian Network for Mood and Anxiety Treatments (CANMAT) Taskforce (21.03.2022)

This guideline suggests a variety of nutraceuticals and phytoceuticals as adjunctive treatments, mainly for MDD. Omega-3 fatty acids are supported in doses ranging from 1–2 grams per day of EPA for the reduction of depressive symptoms when used in combination with standard treatments; vitamin D is recommended, especially in the presence of deficiencies, for MDD and some psychotic disorders. Probiotics, with their ability to modulate the gut-brain axis, are increasingly being considered promising for safely providing adjunctive support in MDD. Zinc and methyl folate are provisionally recommended for

MDD, especially for those cases involving immune dysregulation or genetic polymorphisms impacting metabolism. Both S-adenosyl methionine (SAMe) and N-acetyl cysteine (NAC) have been promising, although NAC is only weakly suggested for obsessive-compulsive and related disorders. St John's Wort has strong support as monotherapy for MDD, but caution is required for possible drug interactions; saffron and curcumin are provisionally recommended for both adjunctive and monotherapy, with curcumin particularly valuable for concomitant inflammatory conditions. Lavender is also suggested for depression and anxiety in standardised formulations. These substances have promising benefits when used adjunctively with conventional treatments, but they are of varying evidence and strength of recommendation.

1.5.2.6 International Society for Nutritional Psychiatry Research Practice Guidelines for Omega-3 Fatty Acids in the Treatment of Major Depressive Disorder (03.09.2019)

In the acute treatment of MDD, n-3 PUFAs (poly-unsaturated fatty acids) should be used only after a comprehensive clinical assessment, including establishing a diagnosis and assessment of physical conditions such as fish hypersensitivity. These treatments are more effective as adjunctive rather than monotherapy, showing an acceleration of the antidepressant onset of action and augmentation of poor initial responses to treatments.

The recommended treatment dose of n-3 PUFAs should be between 1 and 2 grams per day of EPA, either in pure form or combined with DHA, with a ratio of EPA to DHA greater than 2:1. n-3 PUFAs might represent a potential adjunctive prophylactic treatment in high-risk populations, together with standard medical care, for the maintenance and prevention of disease. Continuation after the acute phase might prevent the recurrence of depressive episodes. Safety monitoring should be mandatory and include systematic checks of the main adverse effects, which are GI and dermatological, and a full metabolic panel for those on higher doses of n-3 supplements.

Particularly in patients who are overweight (BMI >25), who have high inflammatory markers, perinatal women, the elderly, or young patients, n-3 PUFA treatment might be beneficial. Adjunctive treatment with either pure EPA or combinations of EPA/DHA at a ratio of >2:1 seems effective for acute MDD, but more evidence is needed to prevent recurrence.

1.6 Nutritional Challenges in Patients with SMI

1.6.1 Eating Disorders and Disordered Eating

Although both disordered eating and eating disorders include problematic eating behaviours, there are some significant differences between them. Disordered eating is a general term used to describe many different unhealthy eating behaviours and negative attitudes towards food, body weight, and appearance. It might include actions such as obsessive dieting, skipping meals, fasting, restricting food intake or intake of particular groups of foods, binge eating, and the use of diuretics, laxatives, or weight loss medications. Compensatory behaviours, such as purging or excessive exercise, are also common. Behaviours may be diverse and not meet the criteria for a clinical diagnosis because they may lack the frequency, duration, or level of psychological distress to fulfil the criteria for an eating disorder.

Eating disorders, on the other hand, are serious mental health conditions characterised by the persistent presence of disordered eating behaviour, leading to serious psychological and physical impairment. The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) details specific criteria for diagnosing each of the major eating disorders: anorexia nervosa (AN), bulimia nervosa (BN), binge eating disorder (BED), avoidant/restrictive food intake disorder (ARFID), and other specified feeding and eating disorders.

Key differences between eating disorders and disordered eating are present in diagnosis, in severity and persistence, as well as in psychological distress and functional impairment. Eating disorders are diagnosed based on the diagnostic criteria outlined in DSM-5. Disordered eating may be a serious problem, but it does not meet the diagnostic criteria due to frequency, duration, or psychological significance. Disordered eating includes body image concerns, dieting, and compensatory behaviours accompanied by psychological distress, but symptoms are not of the severity or duration specified in the DSM-5 (73, 74).

Disordered eating behaviours are more commonly found in individuals with SMI, such as schizophrenia spectrum disorders and mood disorders, including bipolar and depressive disorders (75, 76). High rates of disordered eating have been documented in those with SCZ. For instance, binge eating, defined as an intense urge to consume large amounts of food in a short time regardless of hunger (77), is prevalent in 4% to 45% of this population (75). Food cravings, which refer to a strong desire for specific foods (78), affect between

16% and 64% of individuals with schizophrenia spectrum disorders (75). Additionally, food addiction, characterised by an obsession with eating and planning to obtain food even when not hungry, has a reported prevalence of 27% to 61% in this group (75). Night eating, involving evening hyperphagia and waking up to eat, is reported by 4% to 30% of patients and is often linked with disrupted circadian rhythms and sleep patterns (75).

Excessive food intake, also a sign of disordered eating, is more prevalent in individuals with mood disorders than in those without mental health conditions (79, 80). For example, 27.5% of young adults with BD reported binge or emotional eating and were more likely to engage in unhealthy eating under stress (79). Among women with major depressive or anxiety disorders, 39% reported at least one significant disordered eating behaviour in their lifetime, compared to 11% of women without such disorders (80). This may contribute to the high rates of obesity seen in people with SMI, as overweight and obesity rates in this cohort are two to three times higher than in the general population (81).

Disordered eating is linked to numerous adverse health outcomes, including poor nutritional status marked by higher intake of energy-dense, nutrient-poor foods (82), increased risk of cardiometabolic issues such as higher body mass index, diabetes, and metabolic syndrome (83, 84), and poorer mental health outcomes including depression, anxiety, and psychological distress (85-87). These behaviours also correlate with a lower quality of life (87, 88). In individuals with SMI, disordered eating could be an overlooked factor contributing to poor dietary intake and physical health disparities, which are linked to a 10–15-year reduction in life expectancy compared to the general population (89, 90).

1.6.2 Food Insecurity in Patients with SMI

Food insecurity - lacking consistent access to safe and nutritious food (acc. to UN Human Rights #34) - is widespread among people with SMI (91). In general, several studies report a high rate of food insecurity in individuals with SMI, regardless of income levels or countries involved, with a range as high as 40% (91-93). Among the contributing factors are socioeconomic challenges such as low income, unemployment, and reduced functional capacity, making it difficult to access food regularly (91). Food insecurity within the population of individuals with SMI has been associated with poorer physical health and lower

quality of diet, increased reliance on low-nutrient, high-calorie foods, and risks of obesity and diet-related diseases, such as type 2 diabetes and cardiovascular disorders (91).

Symptoms of poor mental health, such as depression and stress, co-occur with an increased predisposition to experiencing food insecurity; food insecurity may, in turn, exacerbate these symptoms, initiating a cycle that may have effects on subsequent health outcomes (91).

1.6.3 Changes in Eating Behaviour Under Psychiatric and Psychotropic Medication

Certain psychiatric medications, especially SGAs, mood stabilisers, and some antidepressants have been repeatedly reported to cause changes in eating behaviour and subsequent weight gain among patients with SMI (94-96). One of the plausible pieces of evidence shows this weight gain might be related to decreased feelings of satiation and metabolic upheaval, also linked to hormonal changes concerning the levels of leptin and ghrelin, which are associated with appetite regulation (97).

One of the trends that have been found in SMI patients receiving such medications is increasing disinhibition of dietary habits. This includes the loss of control with subsequent overeating when exposed to specific stimuli, for example, palatable food or emotional stress, which is a frequent hazard in patients suffering from SMI. Disinhibition is directly associated with increased BMI, suggesting that patients who develop this loss of control overeating while on psychotropic medication may be more likely to gain weight (98). Dietary restraint, or the purposeful reduction of food intake to maintain body weight, is also frequently reported in this population (98).
However, this restraint could have the adverse effect of creating stress-related activation of the hypothalamic-pituitary-adrenal (HPA) axis, raising cortisol levels and thereby interfering with mood stability (99).

Moreover, available research (8) suggests that combination therapy with SGAs and other psychotropic medications—for example, mood stabilisers and certain antidepressants—may potentiate this weight gain and increase eating disinhibition. However, when added to SGA or mood-stabilizing treatment, antidepressants may moderate the weight effects. Still,

there is also some indication that such combinations might result in even higher levels of disinhibition, further complicating weight management (96). Knowing these dynamics and the mechanisms through which psychotropic medications act on eating behaviours and weight makes a strong case for proactive weight management and dietary counselling approaches as part of treatment for people with SMI.

1.7 Nutritional Care in a Clinical Setting

1.7.1 Professionals in the Nutritional Advice Sector

Recently, with the rise of social media-fuelled nutritional trends and crazes, the nutritional sector as a market is booming. Just the market for dietary supplements alone is enormous, with 220 billion $ worldwide (100), indicating a need for nutritional education in the private sector, but also in the field of medical professionals (21). To ameliorate the gaps in knowledge within the medical community and to satisfy the growing need for nutritional advice in the private sector, a plethora of specialists and specialisations emerged, with some being more recognised and advisable to contact than others.
The following section gives an overview of nutritional advice givers per country in German-speaking European countries.

1.7.1.1 Austria:

Under Austrian law (*Ärztegesetz §49 (3))*, physicians retain primary authority and responsibility for therapeutic decisions in nutritional medicine. This system recognizes three other groups of nutrition professionals, who differ in qualifications and scope of practice: (clinical) dieticians (*Diätolog*innen*), food scientists *(Ernährungswissenschaftler*innen* and related academic programs), and nutritional coaches (*Diplomierte Ernährungstrainer*innen*).
Dieticians, primarily employed in healthcare settings, act as advisors and execute physicians' medical directives. They are the only professionals aside from physicians permitted to offer nutritional guidance to *patients* (i.e. people with any form of illness). By contrast, food scientists are typically employed in public health or the private sector, providing advice limited to *healthy* individuals, such as for weight loss or athletic performance (§ 119 GewO, 12.12.2024).

Nutritional coaches with a diploma obtained by private institutions are confined to private practice, offering “nutritional training”, general nutrition education, workshops, and cooking classes. They are legally prohibited from giving personalized nutritional advice to any individual, healthy or otherwise (Court cases: (101, 102)), (103).
This framework ensures that physicians maintain oversight of nutritional care, delegating tasks to dieticians where appropriate.

1.7.1.2 Germany:

In Germany, the situation is somewhat more complicated: On the one hand, the profession of clinical dietician (Diätassistent*innen) is very similar to the “Diätolog*in” in Austria, as the “Diätassistent*in” is a state-certified healthcare professional, with similar tasks in a clinical setting. A curiosity here is that a dietician’s services are only covered by state insurance in case of metabolic disturbances like cystic fibrosis.
A unique position in the space of nutritional advice holds the profession of ecotrophologists (“Ökotropholog*in / Oecotropholog*in), a university degree specialising in nutrition, food technology and economics. While often working in the management of large kitchens/canteens, ecotrophologists may acquire a certificate from official state-supervised societies, enabling them to give nutritional advice in private practice. Absolvents of other nutrition-adjacent studies like nutritional sciences can also obtain a similar certificate.
A third group that is allowed to give nutritional counselling are alternative practitioners (“Heilpraktiker”), which is a state-certified health professional practicing complementary medicine. After passing an examination covering basic medical, legal and ethical topics, this group of professionals are allowed to diagnose and treat illnesses and are allowed to give personalised nutritional counselling for patients.
Additionally, the term nutritional coach (“Ernährungsberater*in”), is not protected by law in Germany. Hence, a cautious selection of dietary advice is necessary in Germany since non-scientifically backed charlatanerie is widespread in this sector.

1.7.1.3 Switzerland

Our Swiss neighbours are a bit more exact in this regard: On the one hand, the profession of clinical dietician (“Diätolog*in”) with similar tasks and settings of practice exists, on the

other hand, a state-certified nutritional coach (“Ernährungsberater*in”) is allowed to give nutritional advice to private persons.

1.7.2 Clinical Dieticians

Clinical dieticians are trained professionals who specialise in the use of nutrition therapy to prevent and treat various health conditions, including mental health disorders. Nutritional interventions for mental health are becoming increasingly recognised as a valuable complement to traditional psychiatric treatments, and clinical dieticians play an important role in providing evidence-based dietary interventions for mental health disorders. Respectively, they are called “Diätolog*in” (AT, CH) or “Diätassistent*in” (GER).

Clinical dieticians assess patients' nutritional needs and develop personalised dietary plans based on their health goals and conditions. They may also provide education on healthy eating habits, food preparation, and supplementation. The goal of nutritional interventions for mental health is to provide the body with the nutrients it needs to support healthy brain function and improve symptoms of mental health disorders.

In conclusion, clinical dieticians play a vital role in the treatment of psychiatric disorders with nutritional interventions. As such, integrating clinical dieticians in mental health care settings can help provide a holistic approach to treatment and improve overall patient outcomes.

1.7.3 Options for Physicians

As established in 2021 by Mörkl et al. (21), nutritional literacy among physicians is relatively poor. To ameliorate this, further qualifications are offered in Austria, Germany and Switzerland, which include certificate courses, additional qualifications and degree programs that combine basic medical knowledge with specialised knowledge in nutritional medicine.
In Austria, the Austrian Academy of Physicians (ÖÄK) offers a diploma in nutritional medicine, which provides knowledge on preventing and treating nutrition-related diseases in part-time modules lasting 90 hours. The University of Vienna also offers a

postgraduate course in clinical nutrition, which concludes with a Master of Science (MSc) in Clinical Nutrition after four semesters.
In Germany, the German Physicians' Association (Deutsche Ärztekammer) can award the additional title of 'Nutritional Medicine' (Zusatzbezeichnung Ernährungsmedizin) after at least 220 hours of further training according to the training ordinance of the associations (including knowledge on diagnostics, supplements and nutraceuticals as well as prevention and nutrition in palliative care settings) and practical work in this field.
In Switzerland, the Certificate of Competence in Nutritional Medicine from the Swiss Medical Association for Nutritional Medicine (GESKES) is a comprehensive qualification that requires at least 15 ECTS of theory and 3 months of practical training in a specialised centre.

1.7.4 NCP – The Nutrition Care Process (104)

The Nutrition Care Process (NCP) is a structured process nutritionists use to provide personalised nutritional advice. It consists of four main steps: Assessment, Diagnosis, Intervention and Monitoring/Assessment. The NCP allows professionals to customise care based on the client's specific needs and evidence-based practices, improving nutritional care's quality and efficiency.

Nutritional assessment involves collecting data from various sources (e.g., interviews and medical records) to identify nutritional problems. Data is then categorised into six categories: Dietary/eating behaviours, anthropometric measurements, biochemical data, physical findings, client history and assessment tools. The nutritional diagnosis identifies nutrition-related problems using a PES statement (Problem, Etiology, Symptoms). This step identifies issues that can be improved through nutritional intervention. Nutritional intervention focuses on the cause (aetiology) of the nutritional diagnosis. It comprises two phases: Planning (set SMART goals - Specific, Measurable, Achievable, Relevant, and Time-Bound -write prescriptions) and Implementation (executing and adjusting the plan as needed).

Nutritional monitoring and evaluation checks progress against set indicators to ensure interventions are effective and allow for reassessment as needed. The NCP supports different areas of application (e.g., clinical, community health) and is anchored in

professional standards, making it essential for dietetics practice education and accreditation.

1.7.5 Common Nutritional Outcome Measures

Outcome measures are most important in the assessment of nutrition intervention since they describe its effects on the health and quality of life of patients and, if needed, their satisfaction. From following body weight changes to analysing blood test results, these indicators provide essential feedback about the success of dietary changes.
The selection of appropriate measures is important: relevance, validity, and feasibility should guide the selection. The analysis of outcome data allows for careful shaping of future care decisions and drives quality improvement.

The metrics most commonly used are BMI (body mass index), albumin, mini nutritional assessment, and haemoglobin (105). In recent years, apparative procedures to generate nutritional outcome measures via body composition assessment have become increasingly important; examples of these measures are dual-energy X-ray absorptiometry (DXA) scans, magnetic resonance imaging (MRI), muscle ultrasound and bioelectric impedance analysis (BIA). While some are especially useful in intensive care settings, others can also help in nutritional advice settings.
DXA scans, MRI analysis, and BIA offer body composition information through the analysis of adipose tissue quantities. (106) BIA, a non-imaging technique, uses the body's electrical properties and fat as an insulator. It is the least exact in this selection since error sources are copious (variations in limb length, electrode placement and many more). DXA, the gold standard for bone density measurements, can also be used to distinguish body tissue densities by classifying the attenuation of X-rays. It is a quick and easy method with almost negligible X-ray burden to the scanned individual (107). However, detailed measurements of fat tissue infiltration into organs or muscles are impossible (106). Aside from computed tomography (CT) scans (which are less accurate and have more radiation load), this measurement is only possible by MRI scans to date. MRI uses the electromagnetic polarities of hydrogen and water to distinguish fat from other tissues in the body. Fat-referenced MRI is thus the most exact tool for a total body composition analysis (106), but it is not always available due to the increased need for scan time and higher costs. (108)

1.7.6 Current Nutrition Screening Tools for Mental Health

Even with extensive nutritional training, quantifiable data about a patient's nutritional status is increasingly popular in a clinical setting, and it is also for the sometimes-tedious reason of accountability and financing of therapeutic options. With this in mind, screeners are a practical and fast option. In addition to the NutriMental Screener, very few other screening tools for nutrition in psychiatric settings exist, especially none where feasibility was tested in the aforementioned cohort, which faces challenges that are not present in comparable devices in the mentally healthy. Mueller-Sterlin et al. (109) found that people with SMI tend to have high dropout rates, frequent underreporting, and high individual variability in reported energy intake, further warranting caution in nutritional research in this cohort.

In a meta-analysis by Teasdale et al. (90) concerning dietary intake in patients with SMI, no study was found citing a dietary assessment tool that has been previously tested in the cohort of patients with SMI; the remaining studies used 24-hour recall assessments or trained interviewer assessments, which both have their problems, either due to possible patient neurocognitive impairment (110, 111) or interviewer interference and bias (112). Hancox et al. posed a similar question and merely found screening methods for malnutrition, dysphagia, and constipation risks in use in this specific cohort, but none were found for the risk of overnutrition (23).

The only tool with tested validity was found in the realm of nutritional screeners in psychiatric care is the SANSI. This instrument, while being specifically tailored to patients with SMI, had shortcomings for most psychiatric inpatients since it was developed for secure inpatient care, as well as being limited in validity. Therefore, the scarcity of specialised tools for the psychiatric cohort was the main driver for developing the NutriMental screener.

1.8 The NutriMental Screener

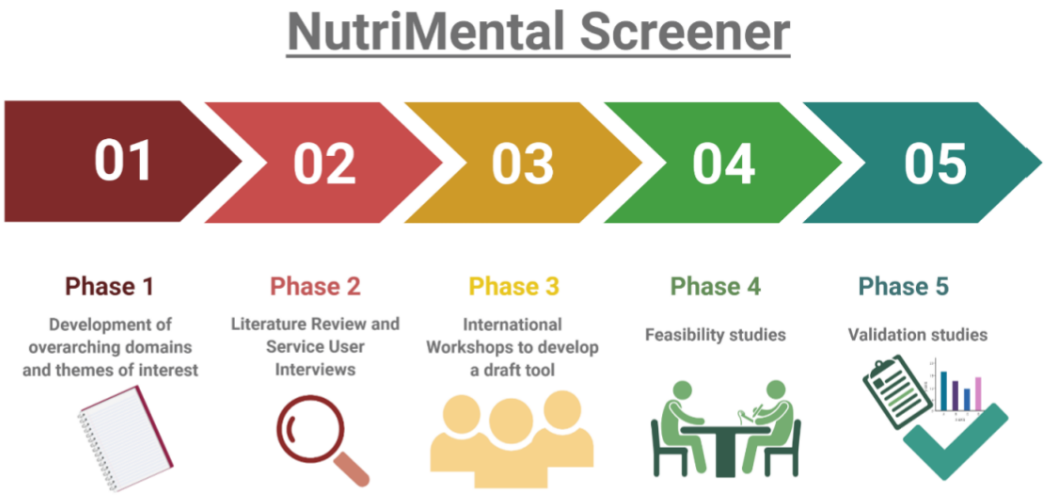
The NutriMental Screener is, as opposed to the previously mentioned assessment tools, a specialised nutrition-risk screening tool being developed for mental health settings to assess and address nutrition-related risks in individuals with SMI. It is designed to facilitate early identification of dietary risks and trigger timely referrals to nutrition specialists, such as dietitians, for comprehensive assessment and intervention. The tool is built to account for the unique dietary challenges and increased risk factors seen in

people with SMI, including weight fluctuations, disordered eating behaviours, and metabolic complications associated with certain psychiatric medications.

1.8.1 Development Phases of the Screener and Structure

The NutriMental Screener is developed through a structured five-phase process (Fig.1):

Figure 1 *Development of the NutriMental Screener*



From: Teasdale, S. B., Moerkl, S., Moetteli, S., & Mueller-Stierlin, A. (2021). The Development of a Nutrition Screening Tool for Mental Health Settings Prone to Obesity and Cardiometabolic Complications: Study Protocol for the NutriMental Screener. International journal of environmental research and public health, 18(21), 11269. https://doi.org/10.3390/ijerph182111269

1.8.1.1 Domain and Theme Identification (Phase I):

The tool's structure is grounded in a review of 17 existing nutrition-screening tools, followed by coding of 194 questions into six overarching domains and 26 themes. These domains capture diverse aspects of nutrition and eating behaviours specific to mental health contexts.

Key domains include disordered eating behaviours, emotional aspects of eating, body weight and shape concerns, general health status, mental health treatments, and lifestyle factors such as exercise and sleep.

1.8.1.2 Literature Review and User Input (Phase II):

Researchers interviewed service users and reviewed relevant literature to identify additional themes. The aim was to reflect on specific issues faced by those with SMI, including emotional eating, food insecurity, and medication-related side effects.

1.8.1.3 Workshops and Draft Development (Phase III):

International workshops with a multidisciplinary group of dietitians, psychiatrists, and other stakeholders helped to refine the tool. Participants rated the relevance of specific questions, leading to a draft version of the tool, which was iteratively adjusted based on feedback.

The draft version includes a comprehensive set of questions across the domains, structured to assess risks like low appetite, overeating, unhealthy food cravings, and physical symptoms related to nutrition.

1.8.1.4 Feasibility Testing (Phase IV):

The tool will be pilot tested in several countries (Australia, Austria, Switzerland) in both inpatient and outpatient settings. Feasibility measures include the ease of use for clinicians, clarity for patients, and the tool's impact on clinical practice, including its ability to prompt referrals to dietitians when needed.

1.8.1.5 Validation Studies (Phase V):

After adjustments based on feasibility study feedback, formal validation will occur. This includes assessing the tool's accuracy, reliability, and how well it correlates with validated nutrition assessments. Researchers will also test its ability to predict cardiometabolic complications and its consistency through test-retest and inter-rater reliability evaluations.

1.8.2 Key Components of the Screener

The NutriMental Screener includes questions organised under the following areas:

- **Disordered Eating Behaviours:** Includes questions on food preoccupation, appetite levels, eating speed, food cravings, and patterns of night eating.

- **Emotional and Behavioural Aspects of Eating**: Assesses factors such as eating due to stress or for emotional relief, feelings of shame or guilt associated with eating, and eating for positive emotional outcomes.
- **Body Image and Weight Concerns**: Covers areas like weight changes, body dissatisfaction, and weight preoccupation, which are prevalent concerns in people with SMI.
- **Physical Health Indicators**: Inquires about symptoms affecting eating, such as dry mouth, difficulty swallowing, and GI issues.
- **Medication and Mental Health Treatment Effects:** Addresses the impact of psychotropic medications on appetite and metabolic health, considering the significant role these drugs play in diet-related side effects.
- **Lifestyle and Physical Activity:** Assesses related lifestyle factors, such as exercise habits, compensatory behaviours (e.g., dieting), and sleep patterns, to provide a holistic view of the individual's health.

1.9 Main Objectives

The primary objective of this study was to evaluate the feasibility of the NutriMental screener, a novel malnutrition screening tool specialised for use in a psychiatric institution. The feasibility was to be tested based on the following criteria, henceforth called primary endpoints.

1.9.1 Primary Endpoints

The primary endpoints are derived from the following parameters:

- Number and diagnostic group of patients with whom the tool was tested
- Number of clinicians using the tool
- Completion time of the tool (additional data)
- User friendliness - Assessment of ease of use by clinicians (feedback questionnaire)
- Comprehensibility of questions by patients
- Referral frequency to dietetics

1.9.2 Secondary Endpoints

Secondary endpoints include the comparison of the collected data to existing literature, mainly the incidence of somatic comorbidities, the behaviour of patients with SMI concerning nutrition and eating and the relationship between medication and nutritional behaviour.

1.9.3 Hypotheses and Research Question

During the study and this work, the research is guided by the following research question and the corresponding hypotheses:

Is the NutriMental Screener feasible and useful in everyday clinical practice?

Main hypothesis: The NutriMental screener is feasible in everyday clinical practice.
Null hypothesis: the NutriMental screener is not feasible in everyday clinical practice

Alternative Hypothesis 1: Patients motivated to receive dietary support are more likely to get it.
Alternative Null Hypothesis 1: Patient motivation to receive dietary support does not influence the likeliness of receiving it.

2 Material and Methods

The study was approved by the ethics committee of the Medical University of Graz (EK34-289 ex 21/22 1092-2022). The study was performed following the ethical standards laid down in the Declaration of Helsinki (113) and its amendments.

This project aimed to pilot a screening tool to improve the quality of mental health care. This intervention sought to replace current nutrition screening procedures for patients with mental illness. The screening tool was evaluated by collecting feedback data from the users (clinicians) who used the NutriMental Screener in routine practice.

2.1 Study Groups

There were two study groups involved in the project. One group included clinicians working in mental health care (nurses, doctors, occupational therapists, physiotherapists, psychotherapists, psychologists, and social workers) who might use the NutriMental Screener as part of their mental health care in the future.
The other group consisted of patients who were in outpatient or inpatient treatment at the Department of Psychiatry and Psychotherapeutic Medicine, University Hospital Graz. The NutriMental Screening Tool was applied to them after they have given their consent.

2.2 Procedure

Clinicians were invited to test the NutriMental Screening Instrument and were trained in using the NutriMental Screener. They received a copy of the NutriMental Screener and instructions on how to use the screening tool. If a patient met the inclusion criteria on admission to the hospital, they were invited to participate in the study, and informed consent was given. Screening should have been carried out within 24 hours of inpatient admission. If the clinician observed a need for support after completing the NutriMental screener, a referral to dietetics should have been made.
The student checked 4 weeks after the declaration of consent whether nutritional counselling by the dietology department had been carried out. In addition to this, clinicians completed an additional information form (NutriMental Screening Supplement). A

student collected further data (so-called additional data) for all participating patients by acquiring this information based on the patient's file. The student reminded the clinician to complete a NutriMental Screener feedback questionnaire every three months (month 3 / month 6 / month 9 / ...). The clinicians filled the additional information form for each screening of the participants. The NutriMental Feedback Questionnaire was only answered every third month.

2.3 Questionnaires

In the context of this study, three questionnaires were used, which are listed in the addendum:

- NutriMental Screener (individual for each participant) (Addendum 1)
- NutriMental Screening Supplement/NutriMental Additional Data (individual for each participant) (Addendum 2)
- NutriMental Feedback Questionnaire (every three months from all users) (Addendum 3)

The NutriMental Screening Supplement included the following items and was completed by the clinician after the NutriMental Screener was performed:

- Screening time
- Patient data (outpatient/inpatient, gender, age, height, weight (now and 6 months ago), diagnoses)
- Calculation of the BMI (kg/m^2)
- Job-specific characteristics of the user
- Current medication of the patient
- Applicability of the NutriMental Screener to this individual
- Own assessment of whether support from a dietician should be recommended

The NutriMental Feedback Questionnaire included the following items and was completed by the clinicians every 3 months:

- Socio-demographic characteristics (gender; age; occupational status)

- Occupation-specific characteristics (country of employment, city, workplace, qualification, specialisation, work experience, year of training, length of study in the country)
- Diagnoses of the screened patients
- Duration of use of the NutriMental Screener
- Number of patients with whom the NutriMental Screener was performed
- Feasibility questions
- Acceptability questions
- Questions about the clinician's own assessment of the content of the Nutri-Mental Screener
- Effectiveness issues
- Suggestions for improving the NutriMental Screener (open question)

2.4 Inclusion and Exclusion Criteria

We aimed to include a wide range of clinicians working in psychiatric care (nurses, doctors, occupational therapists, physiotherapists, psychotherapists, psychologists, and social workers) who could possibly use the NutriMental Screener as part of their mental health care in the future.
The questioners and the questionees were asked for their informed consent.

Inclusion criteria on the questionee side:

- Patients with mental illnesses who were admitted to the Department of Psychiatry and Psychotherapeutic Medicine as inpatients.
- Minimum age 18 years
- Willingness to test the NutriMental Screener
- Capacity for insight and judgement

Exclusion criteria:

- Clinicians who didn't want to perform the NutriMental Screener
- Patients who were admitted according to the Austrian Accommodation Act,
- Patients who didn't have the capacity to consent or whose acute psychiatric illness does not allow them to participate in the screening.

2.5 Sample Size Considerations

This survey was a pilot project being conducted in several international locations (Australia, Austria and Switzerland). Clinicians were asked to complete the NutriMental Screener on admission. The number of cases was determined against the background of practical feasibility at the respective study sites and in consultation with the study teams conducting the study. Approximately four clinicians per site were planned to participate and use the instrument on 60 patients.

2.6 Implementation Period

The project's planned start date was 15 April 2022, and the use of the NutriMental Screener as part of routine care was scheduled for 9 months, with an end date of 15 January 2023.

2.7 Data analysis and evaluation

A data description of the following points is given:

- Number and diagnostic group of patients on whom the tool was tested
- Completion time of the tool (additional data)
- Assessment of ease of use by clinicians (feedback questionnaire)
- Referral frequency to dietetics

Data was analysed using both descriptive and inferential statistics. For numerical data, measures of central tendency and dispersion, including the mean, standard deviation, median, interquartile range (IQR), minimum, and maximum values were calculated. Categorical data were presented as absolute frequencies (counts) or relative frequencies (percentages). The normality of the data was assessed using the Shapiro-Wilk test.
A 95% confidence interval was used for all estimates, and statistical significance was defined as a p-value of less than 0.05. Spearman's r was conducted to test for potential correlations. All statistical analyses were performed using SPSS (version 29) and Microsoft Excel.

All study questionnaires were collected and stored in a lockable room. Only the study team had access to the data. Each participant (clinicians and patients) was assigned a study code to obtain the respective study data in pseudonymised form.

2.8 Risk management

The NutriMental Screener has not yet been formally validated in a clinical setting. Nevertheless, it has been designed specifically for psychiatric healthcare, unlike the malnutrition screening that is currently used routinely. Furthermore, the NutriMental Screener captured not only the risk for malnutrition (the malnutrition screening also captures this) but also additional risks (overeating, emotional eating).

All participants were asked to participate in the questionnaire survey voluntarily after being informed about the inclusion and exclusion criteria, the objectives and the procedure. Participants also confirmed their voluntary participation by checking the box on the ethics committee-approved consent form. If necessary, the questionnaire could've been interrupted or cancelled at any time.

3 Results

3.1 Descriptive Statistics

Within the study's timeframe, we managed to acquire 23 participants in total, of which the majority were in an inpatient setting (19 inpatients, four outpatients). All patients gave informed consent.

3.1.1 Age Distribution

Six patients were under 30, 14 were 30-64 years of age, and four were in the senior age group of >64. The mean age was 40.56 (SD = 19,14) years. The age groups were not normally distributed. (Table 1)

3.1.2 Gender Distribution

The distribution of gender in the cohort was as follows: 17 participants were female (73.9%), six were male, no nonbinary patients or patients refusing to answer this question. (Table 1)

3.1.3 BMI

The BMI was calculated according to the formula and was not normally distributed (Shapiro-Wilk $p<0.05$). The mean BMI of the cohort was 24.5, with a minimum of 15.55 and a maximum of 46.38. (Table 1)

Table 1 *Description of the cohort. IQR= Interquartile Range BMI= Body Mass Index.*

Parameter	Cohort (*n* = 23)	Mean	Median	Minimum	Maximum	IQR	Normality (*p*-value)
Gender (female)	17						
Inpatient	19						
Age [years]	23	40.56	32	20	77	31.5	.003
Height [m]	23	1.67	1.65	1.54	1.80	9.5	.536
Weight [kg]	23	68.21	66	46	110	25	.116
BMI [kg/m²]	23	24.5	23.32	15.55	46.38	6.78	.009

3.1.4 Diagnoses in the Cohort

The spectrum of primary diagnoses in our cohort is detailed in Table 2. Diagnosis of current admission is counted in patients with multiple diagnoses.

Table 2 *Cohort primary diagnoses*

Diagnosis Category	Number of Patients	Percentage of Cohort (%)
Mood Disorders	13	38.3
Anxiety Disorders	5	14.7
Neurotic, stress-related and somatoform disorders	2	5.9
Disorders of adult personality and behaviour	2	5.9
Schizophrenia and Psychotic Disorders	1	2.9

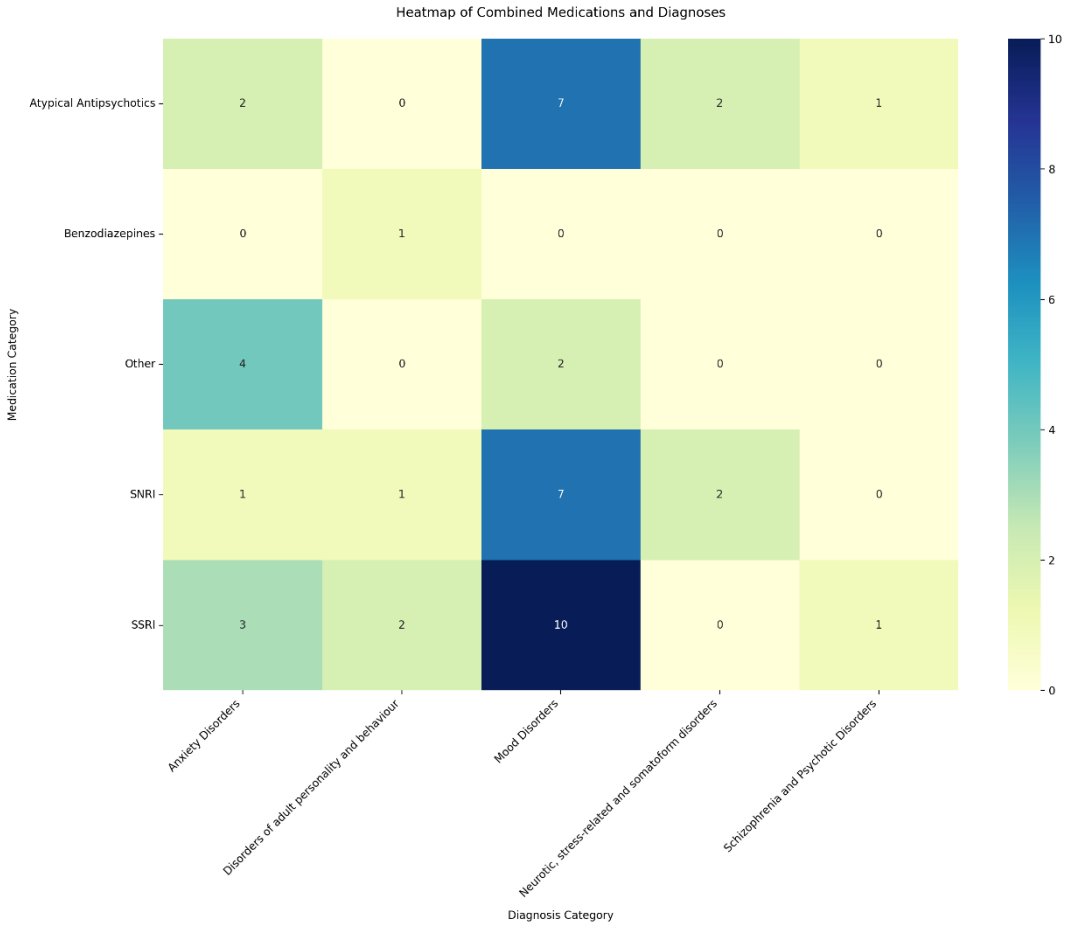
3.1.5 Medication

All patients took at least one psychotropic medication. The most prescribed types of medication were SSRI, atypical antipsychotics and SNRI. (Table 3 and Figure 2)

Table 3 *Medication categories in the cohort. SSRI= Serotonin Reuptake Inhibitors, SNRI= Serotonin and norepinephrine reuptake inhibitors*

Medication Category	Count (*n* = 23)	Fraction (%)
SSRI	16	35
Atypical Antipsychotics	12	26
SNRI	11	24
Other	6	13
Benzodiazepines	1	2

Figure 2 *Heatmap of combined medication and diagnoses SSRI= Serotonin Reuptake Inhibitors, SNRI= Serotonin and norepinephrine reuptake inhibitors*



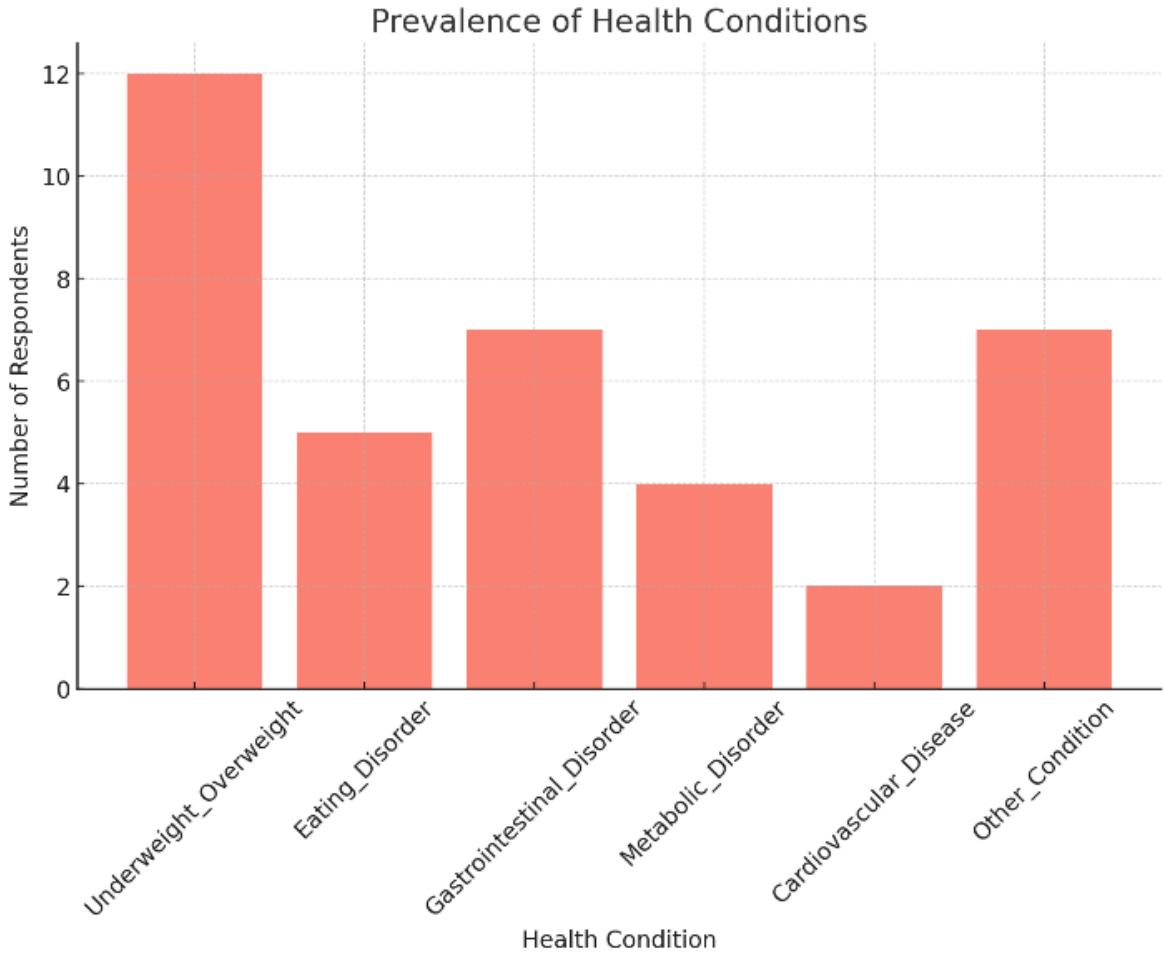
3.1.6 Prevalence of Somatic Conditions

The prevalence of health conditions requiring nutritional advice of the respondents was as follows: 12 participants were either underweight or overweight, five participants suffered from an eating disorder, seven participants suffered from a GI disorder, four suffered from a metabolic disorder, two participants suffered from cardiovascular disease, while seven participants suffered from other conditions. (Table 4)

Table 4 *Prevalence of somatic conditions. GI=gastrointestinal*

Prevalence of somatic conditions	Count (*n* = 23)	Proportion (%)
Condition requiring dietary support	18	78.3
Underweight or Overweight	12	66.8
Eating Disorder	5	27.8
GI Disorder	7	38.9
Endocrine or Metabolic Disorder	4	22.2
Cardiovascular Disease	2	11.1
Other Conditions	5	27.8

Figure 3 *Prevalence of Health Conditions*



3.1.7 Bowel Movements

No cohort participant proclaimed any symptoms of constipation or fewer than three bowel movements per week.

3.1.8 Weight Changes

In the cohort, 43% (n = 10) of participants had a weight change within the last six months. Of 30% of those participants, there was no previous weight data logged. 22% (n = 5) had a weight change logged and planned and/or wished for by the participants. Of those, three participants gained weight, and two participants lost weight.

3.1.9 Appetite Changes

52% (n = 12) of participants reported a change in eating behaviour or appetite within the last month.

3.1.10 Uncontrolled Eating Behaviour

Uncontrolled eating within the last month was a trait experienced by 35% of respondents (n = 8). Of the participants reporting uncontrolled eating, 50% were overweight, three were of normal weight, and one respondent was underweight.

75% of participants reporting eating urges wished for a dietician's support. Of those, 75% received a dietary consultation within four weeks.

3.1.11 Purging Behaviour

Behaviours like fasting, taking laxatives or vomiting in an attempt to control weight were reported by 17.4% (n = 4). Of those patients, three reported to suffer from an eating disorder. One patient in the group was underweight; the other three were of normal weight.

3.1.12 Obsessive Thoughts About Food

Obsessive thoughts about food within the last month were reported by 13% (n = 3) of patients in the cohort. Of these three patients, two also reported to suffer from an eating disorder.

3.1.13 Food Availability

Worries about food affordability were present in only one participant.

3.1.14 Request for Nutritional Advice

Patients requesting nutritional advice amounted to 47% (n = 11). Of those, 63% (n = 7) received nutritional counselling from a clinical dietician or nutritionist.

In the group of patients requesting nutritional advice, seven participants (63%) reported appetite changes within the last month.

3.1.15 Follow up

Eleven participants (47%) received nutritional counselling within 4 weeks of admission.

3.1.16 Time to Completion

The duration of the questionnaire was generally short: in 96% (n = 22) of the cases, the screener took 5 minutes or less to complete. In one case, the time needed to finish was 5-10 minutes.

Ease of completion was also evaluated during the questionnaire; however, this was completed in the absence of the patient, i.e., the medical professional only did the evaluation. In 87% (n = 20) of the cases, the medical professional described ease of completion as "very easy"; in two cases (9%), it was described as "easy"; in one case (4%), ease of completion was described as "hard". (Table 5)

Table 5 *Ease of completion*

Ease of completion	very easy	easy	hard	very hard
count (n = 23)	20	2	1	0
fraction (%)	87	9	4	0

3.1.17 Recommendation of Support

Recommended support by a clinical nutritionist was given in 61% of participants (n = 14). Of that group, 57% (n = 8) did receive support after 4 weeks. For 39% of the participants (n = 9), no strong recommendation for dietary support was given.

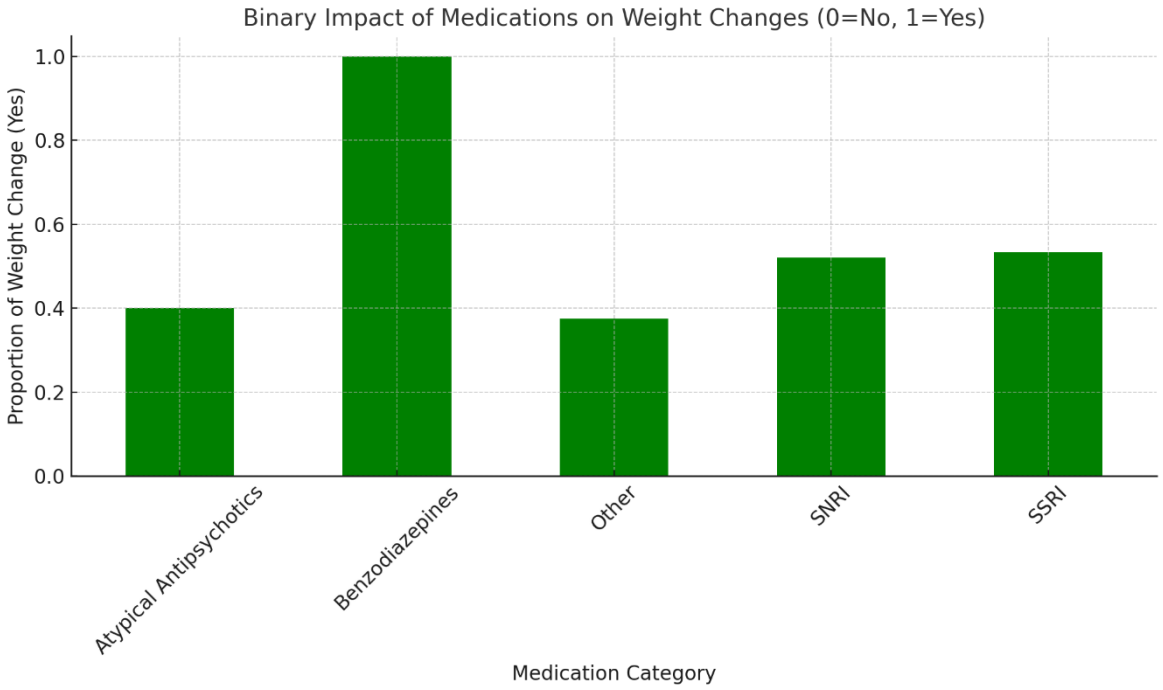
3.1.18 Medication and Changes in Weight

Weight changes were reported by 43% of respondents. 40% of patients taking atypical antipsychotics experienced weight change, 100% of patients taking benzodiazepines, 52% taking SNRIs and 53% of patients taking SSRIs experienced weight changes within the last 6 months (Table 6, Figure 4).

Table 6 *Medication and Weight Change SSRI=serotonin reuptake inhibitors, SNRI: serotonin-noradrenalin reuptake inhibitors*

Medication Group	Fraction of pat. experiencing weight change taking medication group (%)
Atypical Antipsychotics	40
Benzodiazepines	100
Other	37.5
SNRI	52
SSRI	53

Figure 4 *Binary impact of medication on weight changes. SSRI=serotonin reuptake inhibitors, SNRI: serotonin-noradrenalin reuptake inhibitors*



4 Discussion

4.1 Main Hypothesis: The NutriMental screener is feasible in everyday clinical practice.

Our study's results demonstrated a significant rate of acceptance and ease of use among clinicians of the NutriMental screener, highlighting its potential for integration into routine psychiatric care. A rating by all clinicians as “easy to use” indicates a promising possibility for implication. In 96% of cases, the screener was completed in under five minutes and in 96% of filled-out screeners, the clinician rated the completion with patients as “very easy” or “easy”. In only one case, the screener took over five minutes and was labelled as “hard” to complete. Overall, this indicates an excellent feasibility in everyday practice. Nevertheless, adherence was difficult to achieve, as recruiting clinicians willing to fill out the NutriMental screener on patient admission was difficult, pointing to a potential disparity between theoretical results and practical real-life. While the screener has generally been described as easy and fast, the collection of the relatively small dataset took almost two years and wasn’t completed to the extent planned. Further reflection on why this dissonance occurred will follow in the critical reflection.

4.2 Second Hypothesis: Patients interested in dietary support are more likely to get it

Almost half (47% (n = 11)) of patients requested nutritional advice, which indicates the need for holistic treatment of SMI, including side effects of used psychotropic medication also from the patients’ perspective. Of those 11 participants, 63% (n = 7) received nutritional counselling by a clinical dietician or nutritionist within four weeks of admission. While this n = 7 represents approximately a third of the total number of participants, it would be desirable to have more patients receiving the advice they seek. A possible reason for these shortcomings could be the shortage and subsequent rationalization of personnel, as well as inadequate communication of NutriMental screener results within the entire team.

4.3 Additional Metrics

Several of the cohort metrics were not normalised and not representative compared to either psychiatric cohorts or healthy populations. The mean age of the cohort was 40.56 years, which is close to the European average of psychiatric inpatients (114). While there is a general predominance of female patients of inpatient psychiatric care (115), our cohort was heavily skewed towards the female side. Reasons for that could be that more women were admitted to the hospital and volunteered to participate during that timeframe. Additionally, women are more likely to be interested in nutrition (116), making participation in our study more probable. Another contributing factor to the higher participation rate among women is the increased probability that women suffer from depression and anxiety-related disorders, making them a larger fraction of patients at the study centre specifically due to the ward's focus on depressive disorders. A significant reason for the higher prevalence of depression in women is their increased exposure and heightened reaction to everyday stresses (117, 118) like socioeconomic disadvantages as well as sexual and domestic violence, which in itself increases the lifetime prevalence of depression (119). Women also suffer from a generally increased level of inflammation, further contributing to an environment contributing to the genesis of depressive disorders. (120)

The spectrum of diagnoses in our cohort was diverse: 43.8% of patients suffered affective disorders, which is concordant with the majority of the research body (30-50%) (114). With only 3.1% of patients with schizophrenia and schizotypal disorders in our cohort, the fraction is typically larger (15-30%) (121). This disparity may have arisen from the smaller portion of male participants, who usually are more likely to be diagnosed with F20-29 type (acc. to ICD-10 – International Statistical Classification of Diseases and Related Health Problems) disorders, as well as from the temporary closure of the ward specialised in these disorders at the time of the study. Additionally, schizophrenic patients were anecdotally found to be less likely to be willing to take part in this study and are less likely to partake in academic studies in general (122). Anxiety and related disorders were prevalent at 31.3%, which is slightly higher than in the psychiatric inpatient population. Patients suffering from eating disorders were more represented than in other cohorts (114, 121). A potential reason for this may be the ward specialisation and a heightened interest of patients with ED to participate in academic research (123). The fraction of patients with personality disorders was 9.4%, concordant with other cohorts (115), as well as 3.1% suffering from

dissociative disorders, which aligns closely with the upper end of expected prevalence and 3.1% with adjustment disorders, which is also in the range of other cohorts (124).
The BMI was higher in our cohort (mean and median) compared to the general population, but compared to studies in other countries in psychiatric institutions, the BMI was lower or similar. (125, 126). The BMI is, however, a far from perfect metric for the general population (127) since it doesn't account for body composition or body fat distribution, which are both more exact measures for obesity and its impact on health. Nevertheless, with the imperfections of the BMI as a metric for metabolic health and obesity in mind, we can see the health and nutritional issues in the psychiatric patient collective reflected.

4.3.1. Somatic Comorbidities

The high prevalence of physical illness amongst psychiatric patients in this cohort is concordant with other findings (10, 11, 13, 17, 18, 20). Patients with SMI frequently suffer from cardiovascular disease and metabolic syndrome as well as respiratory tract diseases and infections, sexual dysfunction, musculoskeletal diseases and pregnancy complications (18). All in all, a lower health-related quality of Life (HRQoL) was found in patients with SMI, which is reflected in our study (128). The strong connection between somatic and psychiatric conditions is not only clinically visible but also on a pathophysiological level, as activated immuno-inflammatory, oxidative and nitrosative stress (IO&NS) pathways negatively impact psychiatric and somatic health, (129) promoting the development of SMI and contribute to the development of metabolic syndrome and cardiovascular disease (130, 131). These pathophysiological bridges are caused by disturbances in pathways controlling proinflammatory cytokines, with crosslinks to the disruption of intracellular storage and metabolism of lipids, causing an association between chronic neuro- and somatic inflammation (129).

4.3.1.1. Underweight or Overweight (68.8%)

Weight management issues, including both underweight and overweight, are common comorbidities in psychiatric patients due to a combination of medication side effects (especially antipsychotics and mood stabilisers), lifestyle factors, and the effects of psychiatric conditions on metabolism and appetite. In this cohort, the fraction of overweight patients (26.1%) is, however, profoundly smaller compared to the main research body inspecting

weight in psychiatric patients. Several reasons could be at play here: first, the duration of medication intake of SGAs could be shorter in our cohort than in compared cohorts, and thus, obesity-promoting effects may be smaller. A similar assumption could be made about the duration of the disease: the negative effects on weight and metabolic health of SMI are more severe with prolonged disease and repeated episodes (132, 133). Another reason could be that previously admitted patients have already profited from previous nutritional counselling and have adhered to treatment, diet and exercise plans devised from other stays in the study centre. The exact nature of this disparity could be studied further in the future.

4.3.1.2. Eating Disorders (25.0%)

Eating disorders, while in the classical sense generally less common in psychiatric inpatients, are significant in the inspected cohort, indicating a population with complex needs where psychiatric symptoms and eating behaviours intersect. Furthermore, a sampling bias might be present, due to the nature of the hospital wards where questioning took place.
EDs often co-occur with mood disorders, particularly depression and anxiety, and can significantly impact physical health, nutritional status, and overall prognosis. Treating eating disorders alongside other psychiatric conditions requires specialised care and multidisciplinary approaches (134)

4.3.1.3. GI Disorders (37.5%)

GI disorders, such as irritable bowel syndrome (IBS), constipation, and nausea, are frequently reported in psychiatric patients. These symptoms can result from medication side effects, chronic stress, and lifestyle factors associated with mental health conditions.
GI issues can further complicate psychiatric treatment, as they may affect medication absorption and tolerance. These symptoms also contribute to overall discomfort and can exacerbate mental health symptoms. Addressing GI health is essential for improving the quality of life in these patients, as conditions like IBS impact gut health and, thus, subsequently, likely neurotransmitter metabolism (17, 18, 135). While it is crucial for the physician to have a detailed overview about a patient's potential GI disorders, the NutriMental screener does not record details for this topic. In a regular admission procedure, physicians would evaluate such conditions beforehand. Since screening time may be prolonged by addition of in-detail questions, the screener's main purpose of condensing information for

further evaluation may be defeated. If the result of the screening would be a recommendation for dietary counselling, a more detailed approach would follow by a dietitian. Hence, detailed information in the screener may not be beneficial neither for the patient nor the staff. The only reason to have more in-depth questions about GI disorders would be to create a safety net, if a physician failed to evaluate GI health.

4.3.1.4. Endocrine or Metabolic Disorders (18.8%)

Conditions like diabetes and thyroid disorders are common among psychiatric patients, particularly those on long-term antipsychotic medication. These medications are known to cause weight gain, insulin resistance, and other metabolic issues. (136) Metabolic disorders in psychiatric patients often require lifestyle interventions alongside medication adjustments. Monitoring and managing these conditions is crucial due to their impact on this population's cardiovascular health and mortality risk.

4.3.1.5. Cardiovascular Disease (12.5%)

Cardiovascular disease is prevalent among psychiatric patients due to factors like a sedentary lifestyle, poor diet, smoking, and the metabolic effects of psychiatric medications (137). Cardiovascular conditions significantly increase mortality in psychiatric populations; hence, the management of cardiovascular health is essential for reducing the life expectancy gap between psychiatric patients and the general population.

4.3.2. Non-comorbidity Related Metrics

4.3.2.1 Bowel Movements

No participant in the cohort proclaimed any constipation symptoms. Given the nature of the anticholinergic and, thus, motility-reducing side effects of antipsychotic medication, this is a surprising result, especially compared to other literature (138). Since only psychotropic medication was investigated in the NutriMental screener, no motility-inducing agents were listed in the drug charts of this cohort, so a deduction about the nature of this (for the cohort) uncommon phenomenon is hard to make. The use of motility-promoting agents is usually higher and often necessary, particularly in patients treated with clozapine (139), which none of the participants had been prescribed. Another reason for the lack of

constipation symptoms could be that the opposite was the case in this cohort since SSRI and SNRI both may cause diarrhoea and other GI side effects (140, 141).

4.3.2.2 Change of Weight Without Trying

In the cohort, many participants had a weight change within the last six months (n = 10, 43%). Of 30% of those participants, there was no weight data logged. 22% (n = 5) had a weight change that was logged and was planned and/or wished for by the participants. Of those, three participants gained weight; two participants lost weight.

Of the 10 participants reporting unwanted weight change, n = 2 took antidepressants and n = 2 antipsychotics. Fluctuations in weight like the ones reported in the cohort are frequent in psychiatric populations and represent an entirely separate cardiometabolic risk factor aside from the widely known risks of lasting obesity and metabolic syndrome, called weight cycling (WCYC). WCYC describes repeated cycles of loss and gain of weight, influencing metabolic and psychological health and is more common in certain some SMI, such as BD (142) and MDD (143), than in healthy controls. Reasons for these cycles are still under investigation but mood instability, disordered eating and psychotropic medication, all challenges that patients with SMI suffer from, certainly play a role in the genesis of WCYC.

4.3.2.3 Change in Eating Behaviour or Appetite

52% (n = 12) of the participants reported a change in eating behaviour or appetite within the last month. Since the questionnaire was carried out with the patients within the first 24 hours of admission into psychiatric care or in an acute outpatient setting, it can be said that the change in eating behaviour was preceded by a more severe disease. This high incidence of changing nutritional patterns is strongly associated with the current body of research. (5-7, 9, 14) and is concordant with WCYC patterns as mentioned above.

4.3.2.4 Uncontrolled Eating

Within the last month before the survey, this was a trait experienced by 35% of respondents (n = 8). Since the research body is relatively small in this area, no qualified comment can be made about the comparison of these results to the healthy public. However, Rohrer et al. (144) found that 47% of primary care patients reported uncontrolled eating or urges

to binge eat. Of the participants reporting uncontrolled eating, 50% were overweight, three were of normal weight, and one respondent was underweight. 75% of participants reporting eating urges wished for a dietician's support. Of those, a further 75% received a dietary consultation within 4 weeks.

4.3.2.5 Purging Behaviour

Behaviours like fasting, taking laxatives or vomiting in an attempt to control weight were reported by 17.4% (n = 4). Of those patients, three reported to suffer from an eating disorder. One Patient in the group was underweight, and the other three were of normal weight. Bulimia nervosa, being the most common eating disorder-related comorbidity amongst patients with SMD (7-10%) (145-147), makes this high incidence in our cohort realistic.

4.3.2.6 Obsessive Thoughts About Food

Obsessive thoughts about food within the last month were reported by 13% (n = 3) of patients in the cohort. Of these three patients, two also reported to suffer from an eating disorder. Present research links obsessive thinking about food and other traits of eating-disorder-type behaviour to the spectrum of obsessive-compulsive disorders (148, 149), which was not included in the questionnaire, since it's not classified as a severe mental illness. However, it is another aspect of disordered eating, which is prevalent in the researched cohort (87).

4.3.2.7 Food Availability

Worries about food affordability were present in only one participant. Considering the results of the Eurobarometer in the years our study was conducted (2022/23), where up to 89% of respondents expressed concern about the rising cost of living (which includes food prices (150)), the cohort seemed relatively unaffected.

4.3.2.8 Medication and Weight Change

Weight changes were reported by 43% of respondents. 40% of patients taking atypical antipsychotics experienced weight change, 100% of patients taking benzodiazepines, 52% taking SNRIs and 53% of patients taking SSRIs experienced weight changes within the last 6 months. The weight changes of patients taking atypical antipsychotics were expected,

since they were one of the core motivations for creating the NutriMental Screener, although careful differentiation on the specific drug should be made, as major differences in weight gain between different antipsychotic medications were found. (10, 11). A surprise were the findings of weight change in patients taking benzodiazepines, as they are usually described as being weight-neutral (151). Reasons for this finding include other weight-modifying medication taken by the probands, lifestyle changes and changes in disease activity or other reasons connected to WCYC, as mentioned above.

4.3.2.9 Support Recommendation

Recommended support by a clinical nutritionist was given to 61% of participants (n = 14). In 39% of participants (n = 9), no firm recommendation was given. With the evidence for the impact of dietary help as a co-treatment for SMI in mind, it remains unclear why more recommendations were not carried out. This could be attributed to unrecorded dynamics during the face-to-face questionnaire process, the shortage of qualified dietetic personnel leading to triage-like allocation of dietary support, or a lack of informed decision-making (21).

4.4 Critical Reflections and Limitations

This feasibility study aimed to the NutriMental Screener; a targeted nutrition-risk assessment tool developed for use in psychiatric care settings. The findings of the study provide promising evidence of the screener's utility in identifying patients with severe mental illness (SMI) at risk of nutritional imbalances. The results indicate a high prevalence of weight management issues, eating disorders, gastrointestinal (GI) disorders, and metabolic complications among the study participants. Even with reported relatively small time investment, ease of use and good acceptance, the recruitment of clinicians and patients remained difficult. Upon reflection, this may have several reasons, with internal and external factors being at play:

4.5.1 Lack of Clinical Personnel

While being planned to be conducted by various clinical professionals to analyse feasibility extensively, the screener was only used by four professionals in total. In this case, 70% of questionnaires were conducted by the author (bh). Several factors could be at play in why

the recruitment of clinical personnel seemed difficult: overload on the public health system, which shall be discussed in detail below, as well as changes in management and working conditions in the described centre in which the screening was conducted.

4.5.2 General Strain on the Public Health System

In the years 2022-23, while largely being seen as post-pandemic, the strain in the public health sector was still palpable, as scarcity and exertion of personnel, especially amongst nursing staff (133), was and is still widespread. This represents a limiting factor for the conducted research – general stress and overwhelming workload leave little time to perform additional tasks such as our screener. In addition, the bureaucratic admission procedure for (psychiatric) inpatients has evolved into a labour-intensive, strenuous task leaving even less room for additional questionnaires.

4.5.3 Specific Strain on the Studied Centre

While conducting our study, the Psychiatric Clinic of the LKH Graz faced several challenges that added to problems in conducting our project. On the one hand, the at this time temporal closure of one entire ward section with approximately ten additional patients, subtracting potential respondents and being an indicator of the scarcity of medical personnel, made the acquisition of candidates even harder, especially since the ratio of patient phenotype and diagnoses changed as discussed above. On the other hand, the conducting centre faced challenges concerning a change of nursing management, changing personnel partially with subsequent diffusion of tasks and areas of responsibility, occasionally creating difficulties in conducting interviews with patients in the corresponding wards.

4.5.4 Lack of oversight

To conclude the problems in the acquisition of respondents, the author must admit room for improvement concerning the oversight of the conducted study. More could have been done to improve the presence of the study in the minds of the entire staff, like taking part in staff meetings to present the study and underline the importance of adherence or include more potential healthcare professionals to create a wider pool of participants. Another potential motivator could've been to negotiate benefits for study participation with hospital management.

4.6 Clinical and Theoretical Implications

4.6.1 Clinical Implications

The NutriMental Screener is, in theory, an excellent tool for assessing the nutritional needs of the psychiatric inpatient cohort. However, in this trial, the implementation has been difficult at this exact location and timeframe, as previously mentioned. Since the theoretical background of the screener is sound, it is necessary to stress the importance of the researched subject and the need for early dietary intervention, which is too great to be ignored on the grounds of a study not being carried out optimally in one clinic.

4.6.2 Who Should Use the NutriMental Screener?

Since the screener is designed to be as easy to complete as possible and was shown to be filled out quickly and with maximal ease, one may deduct that the training level of the person completing the screener is of inferior importance compared to the fact that the screener is filled out at all. Considering medical professionals' strain and stress levels and the mass of screeners and documents needed for a complete admission in a psychiatric care facility, I suggest having medical students fill out the screeners with patients and report the results to their attending specialists. Since many medical students without clinical experience with psychiatric patients have resentments or an unfavourable attitude towards this particular cohort (152, 153), early contact that includes a specific task to complete may ease up students' prerequisites and facilitate future encounters.

Another option would be to facilitate first contact with the patient and dietary specialist without a psychiatrist involved as gatekeeper, as many psychiatrists might not even recognise a need for dietary support since the specialisation curriculum doesn't include nutritional aspects at all. Even after specialisation, nutritional literacy remains poor among psychiatrists (21), which underlines the fact that psychiatric treatment should be a coordinated team effort of the medical staff of different professions with parties being able to operate independently, helping to optimise processes and patient health.

4.6.3 An Outlook into the Future

Even with the complications of the results of the NutriMental screener in Graz, several applications and options for the future of this screener come to mind. One may be as a platform for much-needed further education of medical personnel in nutrition and nutritional

psychiatry (21). Another way to apply the NutriMental screener would be to serve as thought support for the nutritional needs of psychiatric patients. It could also be used in family medicine and outpatient doctor's offices as screening tools and checklists enhance the probability of a subject being discussed (154). In this case, a NutriMental screener brochure could be a future option, leaving it to patients to assess their needs for dietary support or to give a qualified suggestion to their healthcare provider.

4.6.4 Suggestions for Further Work

During the planned NutriMental screener development, additional validation studies still need to be carried out. After the finalisation of the development, psychiatric care institutions worldwide could implement the NutriMental screener, enabling a larger number of participants to be included with more possibilities concerning measurements of effectiveness.

Other works that could follow up on the actual and implied results of this study could be a study researching the workload of psychiatrists and other medical staff in different locations, making a comparison of those locations possible. Another aspect worth investigating is the reduction of bureaucracy in hospitals, or in this case, psychiatric institutions, as the admission process is often perceived as being more detailed, tedious and connected to several screeners and forms compared to somatic wards. Making a shorter, digital solution possible could reduce bureaucratic workload and make time for actual patient care (155)

4.7 Conclusion

Nutrition knowledge should find more applications in medicine, especially in nutritionally challenged cohorts like psychiatric patients. In this study, we aimed to test the feasibility of the NutriMental screener, which has demonstrated potential as a practical and user-friendly tool for addressing nutrition-related risks in psychiatric settings. The study findings highlighted its high usability, with clinicians reporting ease of use and velocity.

In this trial, the screener facilitated the identification of nutritional challenges, such as metabolic complications and disordered eating behaviours, prompting timely referrals to dietary support. These outcomes underline the relevance of incorporating nutritional considerations into psychiatric care to enhance holistic treatment approaches.

Despite these promising results, challenges remain, including clinician recruitment and adherence and resource limitations in psychiatric facilities. These factors necessitate strategies to improve implementation. Future research should focus on validating the NutriMental Screener in larger and more diverse cohorts, enhancing its predictive accuracy, and integrating it seamlessly into routine clinical workflows. By addressing these areas, the NutriMental Screener can significantly improve health outcomes for individuals with severe mental illnesses, underscoring the critical intersection of nutrition and mental health.

5 Addendum

5.1 NutriMental Screener (Addendum 1)

NutriMental Screener

Studien ID: __ __ __ Bitte beantworten Sie alle Fragen so gut Sie können.

1	Haben Sie eine der folgenden Erkrankungen, die eine Unterstützung durch einen Diätassistenten/klinischen Ernährungsberater erfordern?	□ ja □ nein
1.a	Untergewicht (< 20.0 kg / m²) oder Übergewicht (> 30.0 kg / m²)	□ ja □ nein
1.b	Essstörung (z. B. Anorexia Nervosa, Bulimia Nervosa)	□ ja □ nein
1.c	Erkrankung des gastrointestinalen Systems (z. B. Schluckbeschwerden, Übelkeit, Diarrhö)	□ ja □ nein
1.d	endokrine / Stoffwechselerkrankung (z. B. Diabetes, Hyperlipidämie)	□ ja □ nein
1.e	kardiovaskuläre Erkrankung (z. B. Herzinfarkt)	□ ja □ nein
1.f	Andere: _____ (z. B. Krebs)	□ ja □ nein
2	Hatten Sie im letzten Monat weniger als drei Stuhlgänge pro Woche?	□ ja □ nein
3	Hatten Sie in den letzten 6 Monaten unbeabsichtigte, nennenswerte Gewichtsveränderungen (Gewichtsverlust oder -zunahme)?	□ ja □ nein
4	Hatten Sie im letzten Monat nennenswerte Veränderungen hinsichtlich Ihres Appetits oder Ihres Essverhaltens?	□ ja □ nein

5	Haben Sie seit der Einnahme einer neuen Medikation unbeabsichtigte, nennenswerte Gewichtsveränderungen (Gewichtsverlust oder -zunahme), oder Veränderungen hinsichtlich Ihres Appetits oder Essverhaltens? □ Aktuelle Medikation: _____ _____ □ keine Medikation	□ ja □ nein
6	Gab es im letzten Monat mehrere Tage an denen Sie starken Heißhunger verspürt haben, den Sie nicht kontrollieren konnten?	□ ja □ nein
7	Gab es im letzten Monat mehrere Tage an denen Sie zwanghaft an Essen gedacht haben?	□ ja □ nein
8	Haben Sie im letzten Monat gefastet, sich erbrochen oder Abführmittel eingenommen, um Ihr Gewicht zu kontrollieren?	□ ja □ nein
9	Haben Sie sich im letzten Monat Sorgen gemacht, dass Sie wegen Geldmangels nicht genug zu Essen haben würden?	□ ja □ nein
10	Möchten Sie Unterstützung durch einen Diätassistenten / klinischen Ernährungsberater?	□ ja □ nein

5.2. Screener Additional Information (Addendum 2)

Studien-ID: __ __ __

Studieneinschluss, Datum: __ __ / __ __ / __ __ (tt/mm/jj)

Einwilligung eingeholt: □ ja □ nein

Setting: □ stationär □ ambulant

Alter: __ __ Jahre

Geschlecht: □ männlich □ weiblich □ divers

Diagnosen: 1) F __ __ . __ 2) F __ __ . __ 3) F __ __ . __

Aktuelle Größe: __ . __ __ m

Aktuelles Gewicht: __ __ __ kg

Gewicht vor 6 Monaten: __ __ __ kg, falls unbekannt, ergänze bitte Angaben zu Gewichts-veränderungen:

_____

Aktuelle Medikation _____ seit __ __ __ __ (jjjj)

(Wirkstoffe) _____ seit __ __ __ __ (jjjj)

_____ seit __ __ __ __ (jjjj)

_____ seit __ __ __ __ (jjjj)

_____ seit __ __ __ __ (jjjj)

Follow Up, Datum: __ __ / __ __ / __ __ (tt/mm/jj)

Datenquelle: □ Patientenakte □ Kontakt (Mail oder Telefon)

Wurde innerhalb von 4 Wochen nach dem NutriMental Screening Unterstützung durch eine/n Diätassistenten/in oder klinische/n Ernährungsberater/in angefragt?

□ ja
□ nein
□ weiß nicht

Kommentar:

5.3 Feedback Questionnaire (Addendum 3)

Studien-ID: __ __ __

Initialen (Pflegekraft): __ __

Screening Datum: __ __ / __ __ / __ __ (tt/mm/jj)

Screening Dauer: □ 0-5 □ 5-10 □ > 10 Minuten

Wie beurteilen Sie die Anwendbarkeit des NutriMental Screeners bei diesem Betroffenen?

□ sehr schwierig
□ eher schwierig
□ eher einfach
□ sehr einfach

Kommentar:

Empfehlen Sie aufgrund Ihrer klinischen Einschätzung Unterstützung durch eine/n Diätassistenten/in oder klinische/n Ernährungsberater/in?

□ ja
□ nein
□ weiß nicht

Kommentar:

Einrichtungsname: _____

Initialen: __ __ __

Datum: __ __ / __ __ / __ __ (tt/mm/jj)

Anwendungszeitraum: von __ __ / __ __ / __ __ bis __ __ / __ __ / __ __
(tt/mm/jj)

Anzahl der Patienten: __ __ __
(mit welchen Sie das Screening Tool verwendet haben)

Ihr beruflicher Hintergrund:
□ Psychiater/in □ Arzt/Ärztin (andere Fachrichtung)
□ Psychotherapeut/in □ Psychologe/Psychologin
□ Pfleger/in □ Diätassistent/in
□ Bewegungstherapeut/in □ Physiotherapeut/in
□ Ergotherapeut/in □ Sozialarbeiter/in
□ sonstige: _____

In Ausbildung □ ja □ nein

Diagnosespektrum
Ihrer Patient/innen:
□ Organische, einschließlich symptomatischer psychischer Störungen (F00-F09), z. B. Demenz
□ Psychische und Verhaltensstörungen durch psychotrope Substanzen (F10-F19), z. B. Suchterkrankungen
□ Schizophrenie, schizotype und wahnhafte Störungen (F20-F29)
□ affective Störungen (F30-F39), z. B. Depression oder bipolare Erkrankungen
□ Neurotische, Belastungs- und somatoforme Störungen (F40-F48)
□ Verhaltensauffälligkeiten mit körperlichen Störungen und Faktoren (F50-F59)
□ Persönlichkeits- und Verhaltensstörungen (F60-F69), z. B. Borderline-Erkrankung
□ Intelligenzstörung (F70-F79)
□ Entwicklungsstörungen (F80-F89)
□ Verhaltens- und emotionale Störungen mit Beginn in der Kindheit und Jugend (F90-F98)
□ Sonstige: _____

Machbarkeit	**Ich stimme überhaupt nicht zu.**	**Ich stimme nicht zu.**	**Neutral**	**Ich stimme zu.**	**Ich stimme vollkommen zu.**
Ich war in der Lage, dieses Screening auf der Grundlage der verfügbaren Terminologie und Anweisungen durchzuführen.	1	2	3	4	5
Die Klient/innen waren in der Lage, die Fragen zu verstehen und angemessen zu beantworten.	1	2	3	4	5
Es gab genügend Ressourcen, um das Screening im Rahmen meiner üblichen Tätigkeit durchzuführen.	1	2	3	4	5

Akzeptanz	**Ich stimme überhaupt nicht zu.**	**Ich stimme nicht zu.**	**Neutral**	**Ich stimme zu.**	**Ich stimme vollkommen zu.**
Dieses Screening-Instrument enthält zu viele Fragen.	1	2	3	4	5
Ich würde dieses Screening routinemäßig im klinischen Alltag durchführen.	1	2	3	4	5

Angemessenheit	**Ich stimme überhaupt nicht zu.**	**Ich stimme nicht zu.**	**Neutral**	**Ich stimme zu.**	**Ich stimme vollkommen zu.**
Das Screening zielt auf die Bedürfnisse unserer Klient/innen ab.	1	2	3	4	5
Es fehlen wichtige ernährungsbezogene Fragen.	1	2	3	4	5
Dieses Screening eignet sich besser als die üblichen Mangelernährungs-Screenings für die Anwendung in psychiatrischen Einrichtungen.	1	2	3	4	5

Angemessenheit	**Ich stimme überhaupt nicht zu.**	**Ich stimme nicht zu.**	**Neutral**	**Ich stimme zu.**	**Ich stimme vollkommen zu.**
Das Instrument hat mich dazu gebracht, mehr über die körperliche Gesundheit der Klient/innen nachzudenken.	1	2	3	4	5
Mit diesem Screening konnten Klient/innen identifiziert werden, die Unterstützung bei ernährungsbezogenen Problemen benötigen.	1	2	3	4	5
Das Screening-Instrument ist nützlich für die Behandlungsplanung.	1	2	3	4	5
Das Screening-Instrument kann für die Vermittlung an entsprechende Fachkräfte, z. B. Diätassistent/innen, verwendet werden.	1	2	3	4	5

Haben Sie Änderungsvorschläge für das Screening-Tool, um es zweckmäßiger zu gestalten?

Haben Sie Änderungsvorschläge für die Anweisungen zur Verwendung des Screening-Tools?

Welche Faktoren begünstigen oder beeinträchtigen die Durchführung des Screenings?

6 References

Uncategorized References

1. Barker LA, Gout BS, Crowe TC. Hospital malnutrition: prevalence, identification and impact on patients and the healthcare system. Int J Environ Res Public Health. 2011;8(2):514-27.
2. Cuerda C, Velasco C, Merchan-Naranjo J, Garcia-Peris P, Arango C. The effects of second-generation antipsychotics on food intake, resting energy expenditure and physical activity. Eur J Clin Nutr. 2014;68(2):146-52.
3. Fountaine RJ, Taylor AE, Mancuso JP, Greenway FL, Byerley LO, Smith SR, et al. Increased food intake and energy expenditure following administration of olanzapine to healthy men. Obesity (Silver Spring). 2010;18(8):1646-51.
4. Kluge M, Schuld A, Himmerich H, Dalal M, Schacht A, Wehmeier PM, et al. Clozapine and olanzapine are associated with food craving and binge eating: results from a randomized double-blind study. J Clin Psychopharmacol. 2007;27(6):662-6.
5. Kouidrat Y, Amad A, Lalau JD, Loas G. Eating disorders in schizophrenia: implications for research and management. Schizophr Res Treatment. 2014;2014:791573.
6. Morylowska-Topolska J, Zieminski R, Molas A, Gajewski J, Flis M, Stelmach E, et al. Schizophrenia and anorexia nervosa - reciprocal relationships. A literature review. Psychiatr Pol. 2017;51(2):261-70.
7. Paans NPG, Bot M, van Strien T, Brouwer IA, Visser M, Penninx B. Eating styles in major depressive disorder: Results from a large-scale study. J Psychiatr Res. 2018;97:38-46.
8. Sentissi O, Viala A, Bourdel MC, Kaminski F, Bellisle F, Olie JP, et al. Impact of antipsychotic treatments on the motivation to eat: preliminary results in 153 schizophrenic patients. Int Clin Psychopharmacol. 2009;24(5):257-64.
9. Teasdale SB, Ward PB, Samaras K, Firth J, Stubbs B, Tripodi E, et al. Dietary intake of people with severe mental illness: systematic review and meta-analysis. Br J Psychiatry. 2019;214(5):251-9.
10. Correll CU, Manu P, Olshanskiy V, Napolitano B, Kane JM, Malhotra AK. Cardiometabolic risk of second-generation antipsychotic medications during first-time use in children and adolescents. JAMA. 2009;302(16):1765-73.
11. Alvarez-Jimenez M, Gonzalez-Blanch C, Crespo-Facorro B, Hetrick S, Rodriguez-Sanchez JM, Perez-Iglesias R, et al. Antipsychotic-induced weight gain in chronic and first-episode psychotic disorders: a systematic critical reappraisal. CNS Drugs. 2008;22(7):547-62.
12. Strassnig M, Kotov R, Cornaccio D, Fochtmann L, Harvey PD, Bromet EJ. Twenty-year progression of body mass index in a county-wide cohort of people with schizophrenia and bipolar disorder identified at their first episode of psychosis. Bipolar Disord. 2017;19(5):336-43.
13. De Hert M, Detraux J, van Winkel R, Yu W, Correll CU. Metabolic and cardiovascular adverse effects associated with antipsychotic drugs. Nat Rev Endocrinol. 2011;8(2):114-26.
14. Stubbs B, Williams J, Gaughran F, Craig T. How sedentary are people with psychosis? A systematic review and meta-analysis. Schizophr Res. 2016;171(1-3):103-9.

15. Lawrence D, Johnson SE, Mitrou F, Lawn S, Sawyer M. Tobacco smoking and mental disorders in Australian adolescents. Aust N Z J Psychiatry. 2022;56(2):164-77.
16. Mauri MC, Volonteri LS, De Gaspari IF, Colasanti A, Brambilla MA, Cerruti L. Substance abuse in first-episode schizophrenic patients: a retrospective study. Clin Pract Epidemiol Ment Health. 2006;2:4.
17. Vancampfort D, Stubbs B, Mitchell AJ, De Hert M, Wampers M, Ward PB, et al. Risk of metabolic syndrome and its components in people with schizophrenia and related psychotic disorders, bipolar disorder and major depressive disorder: a systematic review and meta-analysis. World Psychiatry. 2015;14(3):339-47.
18. M DEH, Correll CU, Bobes J, Cetkovich-Bakmas M, Cohen D, Asai I, 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.
19. Jones S, Howard L, Thornicroft G. 'Diagnostic overshadowing': worse physical health care for people with mental illness. Acta Psychiatr Scand. 2008;118(3):169-71.
20. Dornquast C, Tomzik J, Reinhold T, Walle M, Monter N, Berghofer A. To what extent are psychiatrists aware of the comorbid somatic illnesses of their patients with serious mental illnesses? - a cross-sectional secondary data analysis. BMC Health Serv Res. 2017;17(1):162.
21. Morkl S, Stell L, Buhai DV, Schweinzer M, Wagner-Skacel J, Vajda C, et al. 'An Apple a Day'?: Psychiatrists, Psychologists and Psychotherapists Report Poor Literacy for Nutritional Medicine: International Survey Spanning 52 Countries. Nutrients. 2021;13(3).
22. Gandré C, Coldefy M. Disparities in the Use of General Somatic Care among Individuals Treated for Severe Mental Disorders and the General Population in France. Int J Environ Res Public Health. 2020;17(10).
23. Hancox LE, Lee PS, Armaghanian N, Hirani V, Wakefield G. Nutrition risk screening methods for adults living with severe mental illness: A scoping review. Nutr Diet. 2022;79(3):349-63.
24. Dott SG, Weiden P, Hopwood P, Awad AG, Hellewell JSE, Knesevich J, et al. An Innovative Approach to Clinical Communication in Schizophrenia: The Approaches to Schizophrenia Communication Checklists. CNS Spectrums. 2001;6(4):333-8.
25. ROWELL A, LONG C, CHANCE L, DOLLEY O. Identification of nutritional risk by nursing staff in secure psychiatric settings: reliability and validity of St Andrew's Nutrition Screening Instrument. Journal of Psychiatric and Mental Health Nursing. 2012;19(8):722-8.
26. Teasdale SB, Moerkl S, Moetteli S, Mueller-Stierlin A. The Development of a Nutrition Screening Tool for Mental Health Settings Prone to Obesity and Cardiometabolic Complications: Study Protocol for the NutriMental Screener. Int J Environ Res Public Health. 2021;18(21).
27. Goh C, Agius M. The stress-vulnerability model how does stress impact on mental illness at the level of the brain and what are the consequences? Psychiatr Danub. 2010;22(2):198-202.
28. Zubin J, Spring B. Vulnerability--a new view of schizophrenia. J Abnorm Psychol. 1977;86(2):103-26.
29. Luthar SS. Vulnerability and resilience: a study of high-risk adolescents. Child Dev. 1991;62(3):600-16.

30. Howes OD, Kapur S. The dopamine hypothesis of schizophrenia: version III--the final common pathway. Schizophr Bull. 2009;35(3):549-62.
31. Krishnan V, Nestler EJ. The molecular neurobiology of depression. Nature. 2008;455(7215):894-902.
32. Tamminga CA. Schizophrenia and glutamatergic transmission. Crit Rev Neurobiol. 1998;12(1-2):21-36.
33. Coyle JT. NMDA receptor and schizophrenia: a brief history. Schizophr Bull. 2012;38(5):920-6.
34. Luscher B, Shen Q, Sahir N. The GABAergic deficit hypothesis of major depressive disorder. Molecular Psychiatry. 2011;16:383-406.
35. Birtchnell J. The Myth of Mental Illness: Thomas S. Szasz. British Journal of Psychiatry. 1989;155:425 - 9.
36. Engel GL. The need for a new medical model: a challenge for biomedicine. Science. 1977;196(4286):129-36.
37. Egger J. Das biopsychosoziale Krankheitsmodell. Grundzüge eines wissenschaftlich begründeten ganzheitlichen Verständnisses von Krankheit. Psychol Med. 2005;16:3-12.
38. McLaren N. A critical review of the biopsychosocial model. Aust N Z J Psychiatry. 1998;32(1):86-92; discussion 3-6.
39. Van Oudenhove L, Cuypers S. The relevance of the philosophical 'mind-body problem' for the status of psychosomatic medicine: a conceptual analysis of the biopsychosocial model. Med Health Care Philos. 2014;17(2):201-13.
40. Al-Zoairy R, Ress C, Tschoner A, Kaser S, Ebenbichler C. The effects of psychotropic drugs on the regulation of glucose metabolism. Current diabetes reviews. 2013;9 5:362-70.
41. Jacka F. Nutritional psychiatry: implications for public health. European Journal of Public Health. 2021;31(Supplement_3).
42. Aucoin M, LaChance L, Cooley K, Kidd S. Diet and Psychosis: A Scoping Review. Neuropsychobiology. 2020;79(1):20-42.
43. Parletta N, Milte CM, Meyer BJ. Nutritional modulation of cognitive function and mental health. J Nutr Biochem. 2013;24(5):725-43.
44. Parletta N, Zarnowiecki D, Cho J, Wilson A, Bogomolova S, Villani A, et al. A Mediterranean-style dietary intervention supplemented with fish oil improves diet quality and mental health in people with depression: A randomized controlled trial (HELFIMED). Nutritional Neuroscience. 2019;22(7):474-87.
45. Drljača J, Milošević N, Milanović M, Abenavoli L, Milić N. When the microbiome helps the brain-current evidence. CNS Neuroscience & Therapeutics. 2023;29(S1):43-58.
46. Opie RS, Itsiopoulos C, Parletta N, Sanchez-Villegas A, Akbaraly TN, Ruusunen A, et al. Dietary recommendations for the prevention of depression. Nutr Neurosci. 2017;20(3):161-71.
47. Reininghaus EZ, Platzer M, Kohlhammer-Dohr A, Hamm C, Morkl S, Bengesser SA, et al. PROVIT: Supplementary Probiotic Treatment and Vitamin B7 in Depression-A Randomized Controlled Trial. Nutrients. 2020;12(11).
48. Teasdale S, Morkl S, Muller-Stierlin AS. Nutritional psychiatry in the treatment of psychotic disorders: Current hypotheses and research challenges. Brain Behav Immun Health. 2020;5:100070.
49. Morkl S, Wagner-Skacel J, Lahousen T, Lackner S, Holasek SJ, Bengesser SA, et al. The Role of Nutrition and the Gut-Brain Axis in Psychiatry: A Review of the Literature. Neuropsychobiology. 2018:1-9.

50. Chang YY, Ting B, Chen DT, Hsu WT, Lin SC, Kuo CY, et al. Omega-3 Fatty Acids for Depression in the Elderly and Patients with Dementia: A Systematic Review and Meta-Analysis. Healthcare (Basel). 2024;12(5).
51. Bae JH, Kim G. Systematic review and meta-analysis of omega-3-fatty acids in elderly patients with depression. Nutr Res. 2018;50:1-9.
52. Adams PB, Lawson S, Sanigorski A, Sinclair AJ. Arachidonic acid to eicosapentaenoic acid ratio in blood correlates positively with clinical symptoms of depression. Lipids. 1996;31 Suppl:S157-61.
53. Scheffler L, Kovacs P, Fasano A, Heiker JT. Letter to the Editor regarding Morkl et al.'s paper: Gut microbiota, dietary intakes and intestinal permeability reflected by serum zonulin in women. Eur J Nutr. 2018;57(8):2999-3000.
54. Morkl S, Lackner S, Meinitzer A, Mangge H, Lehofer M, Halwachs B, et al. Gut microbiota, dietary intakes and intestinal permeability reflected by serum zonulin in women. Eur J Nutr. 2018;57(8):2985-97.
55. Haroon E, Raison CL, Miller AH. Psychoneuroimmunology meets neuropsychopharmacology: translational implications of the impact of inflammation on behavior. Neuropsychopharmacology. 2012;37(1):137-62.
56. Berk M, Williams LJ, Jacka FN, O'Neil A, Pasco JA, Moylan S, et al. So depression is an inflammatory disease, but where does the inflammation come from? BMC Med. 2013;11:200.
57. Lichtblau N, Schmidt FM, Schumann R, Kirkby KC, Himmerich H. Cytokines as biomarkers in depressive disorder: current standing and prospects. Int Rev Psychiatry. 2013;25(5):592-603.
58. Felger JC, Lotrich FE. Inflammatory cytokines in depression: neurobiological mechanisms and therapeutic implications. Neuroscience. 2013;246:199-229.
59. Sherwin E, Rea K, Dinan TG, Cryan JF. A gut (microbiome) feeling about the brain. Curr Opin Gastroenterol. 2016;32(2):96-102.
60. Evrensel A, Ceylan ME. The Gut-Brain Axis: The Missing Link in Depression. Clin Psychopharmacol Neurosci. 2015;13(3):239-44.
61. Foster JA, McVey Neufeld K-A. Gut–brain axis: how the microbiome influences anxiety and depression. Trends in Neurosciences. 2013;36(5):305-12.
62. Quagliato LA, Nardi AE. Cytokine alterations in panic disorder: A systematic review. J Affect Disord. 2018;228:91-6.
63. Trichopoulou A, Kouris-Blazos A, Wahlqvist ML, Gnardellis C, Lagiou P, Polychronopoulos E, et al. Diet and overall survival in elderly people. Bmj. 1995;311(7018):1457-60.
64. Sánchez-Villegas A, Martínez-González MA, Estruch R, Salas-Salvadó J, Corella D, Covas MI, et al. Mediterranean dietary pattern and depression: the PREDIMED randomized trial. BMC Med. 2013;11:208.
65. Gili M, Comas A, Garcia-Garcia M, Monzon S, Antoni SB, Roca M. Comorbidity between common mental disorders and chronic somatic diseases in primary care patients. Gen Hosp Psychiatry. 2010;32(3):240-5.
66. Oreski I, Jakovljevic M, Aukst-Margetic B, Orlic ZC, Vuksan-Cusa B. Comorbidity and multimorbidity in patients with schizophrenia and bipolar disorder: similarities and differencies. Psychiatr Danub. 2012;24(1):80-5.
67. Agnafors S, Norman Kjellstrom A, Torgerson J, Rusner M. Somatic comorbidity in children and adolescents with psychiatric disorders. Eur Child Adolesc Psychiatry. 2019;28(11):1517-25.

68. Iacovides A, Siamouli M. Comorbid mental and somatic disorders: an epidemiological perspective. Current Opinion in Psychiatry. 2008;21(4):417-21.
69. Chapman DP, Perry GS, Strine TW. The Vital Link Between Chronic Disease and Depressive Disorders. Preventing Chronic Disease. 2004;2.
70. Norwitz NG, Sethi S, Palmer CM. Ketogenic diet as a metabolic treatment for mental illness. Curr Opin Endocrinol Diabetes Obes. 2020;27(5):269-74.
71. Danan A, Westman EC, Saslow LR, Ede G. The Ketogenic Diet for Refractory Mental Illness: A Retrospective Analysis of 31 Inpatients. Front Psychiatry. 2022;13:951376.
72. Firth J, Siddiqi N, Koyanagi A, Siskind D, Rosenbaum S, Galletly C, et al. The Lancet Psychiatry Commission: a blueprint for protecting physical health in people with mental illness. Lancet Psychiatry. 2019;6(8):675-712.
73. Feeding and Eating Disorders. Diagnostic and Statistical Manual of Mental Disorders. DSM Library: American Psychiatric Association Publishing; 2022.
74. Pereira RF, Alvarenga M. Disordered Eating: Identifying, Treating, Preventing, and Differentiating It From Eating Disorders. Diabetes Spectrum. 2007;20(3):141-8.
75. Fornaro M, Daray FM, Hunter F, Anastasia A, Stubbs B, De Berardis D, et al. The prevalence, odds and predictors of lifespan comorbid eating disorder among people with a primary diagnosis of bipolar disorders, and vice-versa: Systematic review and meta-analysis. Journal of Affective Disorders. 2021;280:409-31.
76. Sankaranarayanan A, Johnson K, Mammen SJ, Wilding HE, Vasani D, Murali V, et al. Disordered Eating among People with Schizophrenia Spectrum Disorders: A Systematic Review. Nutrients. 2021;13(11).
77. de Zwaan M. Binge eating disorder and obesity. Int J Obes Relat Metab Disord. 2001;25 Suppl 1:S51-5.
78. Rodríguez-Martín BC, Meule A. Food craving: new contributions on its assessment, moderators, and consequences. Front Psychol. 2015;6:21.
79. Martin K, Woo J, Timmins V, Collins J, Islam A, Newton D, et al. Binge eating and emotional eating behaviors among adolescents and young adults with bipolar disorder. Journal of Affective Disorders. 2016;195:88-95.
80. Garcia SC, Mikhail ME, Keel PK, Burt SA, Neale MC, Boker S, et al. Increased rates of eating disorders and their symptoms in women with major depressive disorder and anxiety disorders. International Journal of Eating Disorders. 2020;53(11):1844-54.
81. Holt Richard IG. The Management of Obesity in People with Severe Mental Illness: An Unresolved Conundrum. Psychotherapy and Psychosomatics. 2019;88(6):327-32.
82. Pursey KM, Collins CE, Stanwell P, Burrows TL. Foods and dietary profiles associated with 'food addiction' in young adults. Addictive Behaviors Reports. 2015;2:41-8.
83. Yoon C, Jacobs Jr DR, Duprez DA, Neumark-Sztainer D, Steffen LM, Mason SM. Problematic eating behaviors and attitudes predict long-term incident metabolic syndrome and diabetes: The Coronary Artery Risk Development in Young Adults Study. International Journal of Eating Disorders. 2019;52(3):304-8.
84. Nagata JM, Garber AK, Tabler J, Murray SB, Vittinghoff E, Bibbins-Domingo K. Disordered eating behaviors and cardiometabolic risk among young adults with overweight or obesity. International Journal of Eating Disorders. 2018;51(8):931-41.

85. Burrows T, Kay-Lambkin F, Pursey K, Skinner J, Dayas C. Food addiction and associations with mental health symptoms: a systematic review with meta-analysis. J Hum Nutr Diet. 2018;31(4):544-72.
86. Kärkkäinen U, Mustelin L, Raevuori A, Kaprio J, Keski-Rahkonen A. Do Disordered Eating Behaviours Have Long-term Health-related Consequences? European Eating Disorders Review. 2018;26(1):22-8.
87. Herpertz-Dahlmann B, Wille N, Hölling H, Vloet TD, Ravens-Sieberer U, the Bsg. Disordered eating behaviour and attitudes, associated psychopathology and health-related quality of life: results of the BELLA study. European Child & Adolescent Psychiatry. 2008;17(1):82-91.
88. Wade TD, Wilksch SM, Lee C. A longitudinal investigation of the impact of disordered eating on young women's quality of life. Health Psychol. 2012;31(3):352-9.
89. Firth J, Siddiqi N, Koyanagi A, Siskind D, Rosenbaum S, Galletly C, et al. The Lancet Psychiatry Commission: a blueprint for protecting physical health in people with mental illness. The Lancet Psychiatry. 2019;6(8):675-712.
90. Teasdale SB, Ward PB, Samaras K, Firth J, Stubbs B, Tripodi E, et al. Dietary intake of people with severe mental illness: systematic review and meta-analysis. The British Journal of Psychiatry. 2019;214(5):251-9.
91. Teasdale SB, Mueller-Stierlin AS, Ruusunen A, Eaton M, Marx W, Firth J. Prevalence of food insecurity in people with major depression, bipolar disorder, and schizophrenia and related psychoses: A systematic review and meta-analysis. Critical Reviews in Food Science and Nutrition. 2021;63:4485 - 502.
92. Pourmotabbed A, Moradi S, Babaei A, Ghavami A, Mohammadi H, Jalili C, et al. Food insecurity and mental health: a systematic review and meta-analysis. Public Health Nutrition. 2020;23(10):1778-90.
93. Arenas DJ, Thomas A, Wang J, DeLisser HM. A Systematic Review and Meta-analysis of Depression, Anxiety, and Sleep Disorders in US Adults with Food Insecurity. Journal of General Internal Medicine. 2019;34(12):2874-82.
94. Blouin M, Tremblay A, Jalbert ME, Venables H, Bouchard RH, Roy MA, et al. Adiposity and eating behaviors in patients under second generation antipsychotics. Obesity (Silver Spring). 2008;16(8):1780-7.
95. Wysokiński A, Kloszewska I. Mechanisms of Increased Appetite and Weight Gain Induced by Psychotropic Medications. Journal of Advanced Clinical Pharmacology. 2014;1:12-33.
96. Davison KM. The relationships among psychiatric medications, eating behaviors, and weight. Eat Behav. 2013;14(2):187-91.
97. Esen-Danaci A, Sarandöl A, Taneli F, Yurtsever F, Ozlen N. Effects of second generation antipsychotics on leptin and ghrelin. Prog Neuropsychopharmacol Biol Psychiatry. 2008;32(6):1434-8.
98. Knolle-Veentjer S, Huth V, Ferstl R, Aldenhoff JB, Hinze-Selch D. Delay of gratification and executive performance in individuals with schizophrenia: putative role for eating behavior and body weight regulation. J Psychiatr Res. 2008;42(2):98-105.
99. Miller DB, O'Callaghan JP. Neuroendocrine aspects of the response to stress. Metabolism. 2002;51(6 Suppl 1):5-10.
100. Hys K, editor Identification of the Reasons Why Individual Consumers Purchase Dietary Supplements2020.
101. OLG Wien 2 R 56/17w, (2017).
102. LVwG-851099/5/Bm/FK, (2018a).

103. VEÖ. Gerichtsurteile zu Ernährungsberatung, Rechtsprechungsübersicht2024.
104. Lacey K, Pritchett E. Nutrition Care Process and Model: ADA adopts road map to quality care and outcomes management. Journal of the American Dietetic Association. 2003;103(8):1061-72.
105. Savicka L, Salaka S, Bērziņa G. Comparison of Content and Psychometric Properties of Malnutrition Outcome Measures: A Systematic Review. J Rehabil Med. 2022;54:jrm00287.
106. Borga M, West J, Bell JD, Harvey NC, Romu T, Heymsfield SB, et al. Advanced Body Composition Assessment: From Body Mass Index to Body Composition Profiling. Journal of Investigative Medicine. 2018;66(5):1-9.
107. Bandirali M, Lanza E, Messina C, Sconfienza LM, Brambilla R, Maurizio R, et al. Dose absorption in lumbar and femoral dual energy X-ray absorptiometry examinations using three different scan modalities: an anthropomorphic phantom study. Journal of clinical densitometry : the official journal of the International Society for Clinical Densitometry. 2013;16 3:279-82.
108. McLane HC, Berkowitz AL, Patenaude BN, McKenzie ED, Wolper E, Wahlster S, et al. Availability, accessibility, and affordability of neurodiagnostic tests in 37 countries. Neurology. 2015;85:1614 - 22.
109. Mueller-Stierlin AS, Teasdale SB, Dinc U, Moerkl S, Prinz N, Becker T, et al. Feasibility and Acceptability of Photographic Food Record, Food Diary and Weighed Food Record in People with Serious Mental Illness. Nutrients. 2021;13(8).
110. Evans VC, Iverson GL, Yatham LN, Lam RW. The relationship between neurocognitive and psychosocial functioning in major depressive disorder: a systematic review. J Clin Psychiatry. 2014;75(12):1359-70.
111. Rocca P, Galderisi S, Rossi A, Bertolino A, Rucci P, Gibertoni D, et al. Disorganization and real-world functioning in schizophrenia: Results from the multicenter study of the Italian Network for Research on Psychoses. Schizophrenia Research. 2018;201:105-12.
112. Richman WL, Kiesler S, Weisband S, Drasgow F. A meta-analytic study of social desirability distortion in computer-administered questionnaires, traditional questionnaires, and interviews. Journal of Applied Psychology. 1999;84(5):754-75.
113. Association WM. World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Participants. JAMA. 2025;333(1):71-4.
114. Bandelow B, Schuller K. Mean age and gender distribution of patients with major mental disorders participating in clinical trials. Eur Arch Psychiatry Clin Neurosci. 2020;270(6):655-9.
115. Trancas B, Ribeiro R, Alexandre J, Cardoso G. Gender Differences in Patients Admitted to Psychiatry: A 4-year Retrospective Study. European Psychiatry. 2020;24(S1).
116. Engelhardt K, Ahn BC, Cho S-I, Joung H. Predictors of interest in nutrition topics and willingness to participate in local nutrition programmes. Journal of Public Health. 2006;29(1):9-12.
117. Maciejewski PK, Prigerson HG, Mazure CM. Sex differences in event-related risk for major depression. Psychol Med. 2001;31(4):593-604.
118. Bangasser DA, Valentino RJ. Sex differences in stress-related psychiatric disorders: neurobiological perspectives. Front Neuroendocrinol. 2014;35(3):303-19.

119. Dienemann J, Boyle E, Baker D, Resnick W, Wiederhorn N, Campbell J. INTIMATE PARTNER ABUSE AMONG WOMEN DIAGNOSED WITH DEPRESSION. Issues in Mental Health Nursing. 2000;21(5):499-513.
120. Derry HM, Padin AC, Kuo JL, Hughes S, Kiecolt-Glaser JK. Sex Differences in Depression: Does Inflammation Play a Role? Current Psychiatry Reports. 2015;17(10):78.
121. Oliveira P, Coroa M, Madeira N, Santos V. Sex differences in psychiatric inpatients: Demographics, psychiatric diagnoses and medical comorbidities. European Psychiatry. 2020;41(S1):S698-S.
122. Hummer M, Holzmeister R, Kemmler G, Eder U, Hofer A, Kurzthaler I, et al. Attitudes of patients with schizophrenia toward placebo-controlled clinical trials. J Clin Psychiatry. 2003;64(3):277-81.
123. Nutley S, Varma D, Chen X, Striley CW. Willingness of individuals with eating disorders to participate in health research. International Journal of Eating Disorders. 2019;52(8):914-23.
124. Bandelow B, Schüller K. Mean age and gender distribution of patients with major mental disorders participating in clinical trials. European Archives of Psychiatry and Clinical Neuroscience. 2020;270(6):655-9.
125. Every-Palmer S, Huthwaite MA, Elmslie JL, Grant E, Romans SE. Long-term psychiatric inpatients' perspectives on weight gain, body satisfaction, diet and physical activity: a mixed methods study. BMC Psychiatry. 2018;18(1):300.
126. Li X, Shi X, Tan Y, Yu Y, Tang C, Xu G, et al. Metabolic indexes of obesity in patients with common mental disorders in stable stage. BMC Psychiatry. 2022;22(1):91.
127. Wu Y, Li D, Vermund SH. Advantages and Limitations of the Body Mass Index (BMI) to Assess Adult Obesity. Int J Environ Res Public Health. 2024;21(6).
128. Filipčić I, Filipčić I, Matić K, Lovretić V, Ivezić E, Bajić Ž, et al. Somatic comorbidities are independently associated with the poor health-related quality of life in psychiatric patients. Psychiatr Danub. 2016;28(3):284-92.
129. Morris G, Puri BK, Walker AJ, Maes M, Carvalho AF, Bortolasci CC, et al. Shared pathways for neuroprogression and somatoprogression in neuropsychiatric disorders. Neuroscience & Biobehavioral Reviews. 2019;107:862-82.
130. de Mello AH, Costa AB, Engel JDG, Rezin GT. Mitochondrial dysfunction in obesity. Life Sciences. 2018;192:26-32.
131. de Melo LGP, Nunes SOV, Anderson G, Vargas HO, Barbosa DS, Galecki P, et al. Shared metabolic and immune-inflammatory, oxidative and nitrosative stress pathways in the metabolic syndrome and mood disorders. Progress in Neuro-Psychopharmacology and Biological Psychiatry. 2017;78:34-50.
132. Heald AH, Martin JL, Payton T, Khalid L, Anderson SG, Narayanan RP, et al. Changes in metabolic parameters in patients with severe mental illness over a 10-year period: A retrospective cohort study. Aust N Z J Psychiatry. 2017;51(1):75-82.
133. M DEH, Schreurs V, Vancampfort D, R VANW. Metabolic syndrome in people with schizophrenia: a review. World Psychiatry. 2009;8(1):15-22.
134. Kessler RC, Merikangas KR. The National Comorbidity Survey Replication (NCS-R): background and aims. Int J Methods Psychiatr Res. 2004;13(2):60-8.
135. Stassen HH, Bachmann S, Bridler R, Cattapan K, Herzig D, Schneeberger A, et al. Inflammatory processes linked to major depression and schizophrenic disorders and the effects of polypharmacy in psychiatry: evidence from a

longitudinal study of 279 patients under therapy. European Archives of Psychiatry and Clinical Neuroscience. 2020;271(3):507-20.
136. Saccaro LF, Aimo A, Panichella G, Sentissi O. Shared and unique characteristics of metabolic syndrome in psychotic disorders: a review. Frontiers in Psychiatry. 2024;15.
137. Colton CW, Manderscheid RW. 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):A42.
138. Every-Palmer S, Newton-Howes G, Clarke MJ. Pharmacological treatment for antipsychotic-related constipation. Cochrane Database of Systematic Reviews. 2017;2017(1).
139. Every-Palmer S, Nowitz M, Stanley J, Grant E, Huthwaite M, Dunn H, et al. Clozapine-treated Patients Have Marked Gastrointestinal Hypomotility, the Probable Basis of Life-threatening Gastrointestinal Complications: A Cross Sectional Study. eBioMedicine. 2016;5:125-34.
140. Shelton RC. Serotonin and Norepinephrine Reuptake Inhibitors. In: Macaluso M, Preskorn SH, editors. Antidepressants: From Biogenic Amines to New Mechanisms of Action. Cham: Springer International Publishing; 2019. p. 145-80.
141. Trindade E, Menon D, Topfer LA, Coloma C. Adverse effects associated with selective serotonin reuptake inhibitors and tricyclic antidepressants: a meta-analysis. Cmaj. 1998;159(10):1245-52.
142. Reininghaus EZ, Lackner N, Fellendorf FT, Bengesser S, Birner A, Reininghaus B, et al. Weight cycling in bipolar disorder. Journal of Affective Disorders. 2015;171:33-8.
143. Kensinger GJ, Murtaugh MA, Reichmann SK, Tangney CC. Psychological Symptoms are Greater Among Weight Cycling Women with Severe Binge Eating Behavior. Journal of the American Dietetic Association. 1998;98(8):863-8.
144. Rohrer JE, Vickers-Douglas KS, Stroebel RJ. Uncontrolled eating and obesity in adult primary care patients. Obes Res Clin Pract. 2009;3(2):I-II.
145. Gotestam KG, Eriksen L, Hagen H. An epidemiological study of eating disorders in Norwegian psychiatric institutions. Int J Eat Disord. 1995;18(3):263-8.
146. Hay PJ, Hall A. The prevalence of eating disorders in recently admitted psychiatric in-patients. Br J Psychiatry. 1991;159:562-5.
147. Kutcher SP, Whitehouse AM, Freeman CP. "Hidden" eating disorders in Scottish psychiatric inpatients. Am J Psychiatry. 1985;142(12):1475-8.
148. Pruneti C, Coscioni G, Guidotti S. A Systematic Review of Clinical Psychophysiology of Obsessive-Compulsive Disorders: Does the Obsession with Diet Also Alter the Autonomic Imbalance of Orthorexic Patients? Nutrients. 2023;15(3).
149. Rothenberg A. Eating disorder as a modern obsessive-compulsive syndrome. Psychiatry. 1986;49(1):45-53.
150. Broadbent P, Thomson R, Kopasker D, McCartney G, Meier P, Richiardi M, et al. The public health implications of the cost-of-living crisis: outlining mechanisms and modelling consequences. Lancet Reg Health Eur. 2023;27:100585.
151. Dent R, Blackmore A, Peterson J, Habib R, Kay GP, Gervais A, et al. Changes in body weight and psychotropic drugs: a systematic synthesis of the literature. PloS one. 2012;7(6):e36889.

152. Rudnick A. Attitudes of Pre-clinical Medical Students towards Psychiatric Patients Before and After an Early Clinical Experience. Canadian Medical Education Journal. 2011;2(1):e11-e5.
153. Wilkinson DG, Greer S, Toone BK. Medical students' attitudes to psychiatry. Psychol Med. 1983;13(1):185-92.
154. Behrmann M, Zemel R, Mozer M. Object-Based Attention and Occlusion: Evidence From Normal Participants and a Computational Model. Journal of experimental psychology Human perception and performance. 1998;24:1011-36.
155. Blom JD, Smink F, Kwidama E, Rivero V. Red tape in psychiatry: On bureaucracy, bureaucratism, and our secret fondness for procedures. Tijdschrift voor psychiatrie. 2016;58:520-8.