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**Original Article**

# Integrating Hydro-Kinesiotherapy in the Therapeutical Management of Metabolic Syndrome in Patients with Mental Disorders – A Case Study

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**Abstract**

Metabolic syndrome represents a complex interaction between genetic, behavioral, and environmental factors, and is associated with an increased risk of cardiovascular disease and type 2 diabetes. In patients with mental disorders, the prevalence of metabolic syndrome is significantly higher, being influenced by a sedentary lifestyle, psychotropic medication and difficulties with emotional regulation. The present paper investigates the effectiveness of an individualized hydro-kinesiotherapy program, meant to improve morpho-functional and psycho-emotional parameters in a patient diagnosed with both metabolic syndrome and mental disorders. Through an initial and final assessment of functional and metabolic parameters, the study aims to identify the changes induced by the therapeutic program and to quantify its impact on the quality of life. The results obtained suggest that a holistic and individualized approach can contribute to reducing risk factors, improving overall health status, and supporting a favorable prognosis for the patient affected by this complex condition.

## 1. Introduction

Obesity among young people represents a major public health issue, being associated with numerous metabolic and psychological comorbidities and requiring multidisciplinary interventions (Oravitan, & Avram, 2008). Regarding the role of kinesiotherapy in optimizing mobility and psychomotor development (Cioroiu, 2025), specialized literature highlights a strong connection between metabolic

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dysfunctions and severe mental disorders. Metabolic syndrome is commonly observed in patients with schizophrenia, bipolar disorder, and major depressive episodes (Newcomer, 2007), and these conditions are thought to share underlying biological mechanisms (Nousen, Ranco, & Sullivan, 2014). The EPA statement highlights how these comorbidities contribute significantly to morbidity and mortality (De Hert et al., 2009), and recent studies indicate that obesity further increases the risk of developing psychiatric disorders (Leutner, et al., 2023). Psychotherapeutic interventions can enhance emotional self-regulation (Avram, Dumitrescu, Weldon, Botez & Ghiuru, 2015), while regular physical activity benefits both physical and mental health (Sharma, Madaan, Petty, 2006) and helps reduce metabolic and psychiatric symptoms in individuals with schizophrenia (Schmitt, et al., 2018).

The increased cardiovascular morbidity in schizophrenia is influenced by behavioral, genetic, and disease-specific factors (Knapen, Vancampfort, Moriën, & Marchal, 2015; Vancampfort, et al., 2011). In addition, patients with a first psychotic episode present consistent metabolic abnormalities (Cortés Fernández, (2018). Kinesiotherapists play an essential role in managing the somatic comorbidities of schizophrenia, such as cardiovascular diseases, diabetes or obesity (Stubbs, et al., 2014), contributing substantially to multidisciplinary care (Vancampfort, 2012a). Metabolic syndrome further diminishes the physical performance and functional capacity of individuals with schizophrenia (Vancampfort, 2012b).

## 2. Material and methods

In this study, it is assumed that elaborating and applying an individualized hydro-kinesiotherapy exercise program can lead to a significant improvement in the physical health and morpho-functional parameters of a patient with schizophrenia.

The objectives of this paper are to:

- Monitor changes in the morpho-functional parameters of a patient with schizophrenia undergoing a hydro-kinesiotherapy program;
- Identify the most suitable hydro-kinesiotherapy exercises for managing metabolic syndrome in patients with schizophrenia;
- Analyze and interpret the results to assess the impact of hydro-kinesiotherapy on the patient's health;
- Ensure long-term follow-up to maintain the results achieved and adjust interventions based on the patient's progress and lifestyle changes.

Research methods used:

- The review of specialized literature, used to link metabolic syndrome, mental disorders and the role of kinesiotherapy oriented prophylaxis in the therapeuthical process;
- The observation method, used to monitor the patient's behavior during the program;
- The testing method, including anthropometric measurements (height, weight, waist circumference), assessment of exercise capacity, and cardiac and

respiratory function;

- The case study method, used for individualized patient analysis;
- The tabular-graphical method, used for presenting and interpreting the results.

Inclusion criteria: patient with metabolic syndrome or associated conditions (diabetes, hypertension, dyslipidemia, obesity), with stabilized mental disorders due to psychiatric medical treatment; Age range 18-35 years old; Available for regular participation in therapy sessions; Informed consent from the patient or legal guardians.

Presentation of the case study:

The patient, P.E., is a 22-year old male, living in an urban environment with his adoptive parents. Due to prior family issues, having elevated susceptibility to addictive patterns and experiencing gradual deterioration of his vulnerable psychological and emotional health, the patient adopted an antisocial, sedentary, and health-compromising lifestyle, which persisted for approximately 2-3 years. During this period, he indulged in the excessive consumption of alcohol, tobacco, and psychoactive substances, developing aharmful dependency. His diet mainly consisted of processed foods, fast food, fats and refined sugars. Sleep was also a neglected factor, many of his nights being spent in front of the computer, without allowing himself to have any adequate rest. Reaching a critical point in his life, the patient decided to make major lifestyle changes, feeling lost and unhappy with his previous life altering choices.

Currently, the patient attends regular psychotherapy sessions, is regularly checked by a psychiatrist, a diabetologist and a cardiologist, undergoes regular medical tests and strictly adheres to the prescribed medication. His family provides constant support and closely monitors the progress of his health. Family history reveals a predisposition to type 2 diabetes and to being overweight, which increases the patient's metabolic risk, highlighting the necessity of an individualized approach within the therapeutical exercise program.

Primary medical diagnoses of the patient include: insulin-resistance, poorly controlled type 2 diabetes with associated hypoglycemic episodes, hepatic steatosis, mixed dyslipidemia, grade II arterial hypertension with high cardiovascular risk, grade II obesity. Psychiatric diagnoses of the patient include: anxious-depressive syndrome, bipolar personality disorder, schizoid personality disorder, which manifests with active psychotic episodes in the absence of treatment. Associated comorbidities: bradypsychia and bradylalia.

Study setting: the program was conducted both at the Natation and Kinesiotherapy Complex of „Ștefan cel Mare" University of Suceava and at the patient's house, with interventions adapted according to the program stages and the patient's health progress. Various means, methods and materials were used to implement the program, sourced from the university's facilities. The study lasted a total of 12 weeks (from the 26$^{th}$ of February until the 13$^{th}$ of May, 2024). The program was split into three stages, each with specific objectives. Prior to each session, heart rate, respiratory rate and blood glucose levels were checked and

measured. These procedures were repeated at the midpoint and end of the therapeutic session, as a way to ensure the proper monitoring of the patient's health status. In critical cases, the session was immediately stopped and attention was focused on restoring the patient's vital parameters back to normal, thereby ensuring his safety.

**Table 1** *Stage I of the Therapeutic Program*

| Element | Description |
|---|---|
| Location | Natation and Kinesiotherapy Complex of „Ștefan cel Mare" University of Suceava |
| Duration | 2 weeks |
| Session frequency | 2 sessions/week |
| Session length | 60 minutes |
| Objectives | • Introducing physical activity into daily life to build a healthy routine<br>• Acclimating the body to exercise<br>• Monitoring and stabilizing cardiovascular response to exercise<br>• Reducing blood glucose and improving lipid profile |

**Table 2.** *Exercises in Stage I*

| No. | Exercise | Description | Dosage |
|---|---|---|---|
| 1 | Walking in water | Walking forward and backward along the pool length with correct posture and synchronized limb movement | 5 minutes |
| 2 | Running in water | Running with active knee flexion and controlled breathing | 5 minutes |
| 3 | Hip abduction | Support on the pool edge; abduct the thigh and return | 2 × 10–15 reps/leg |
| 4 | Thigh flexion and extension | Lift the knee to hip level, then extend backward | 2 × 10–15 reps/leg |
| 5 | Wall push-ups in the pool | Push against the wall with arms and lower slowly | 2 × 8–12 reps |
| 6 | Jumping Jacks in water | Simultaneous leg abduction and arm raise, then return | 2 × 10–15 reps |
| 7 | Knee flexion | Alternately lift knees to chest while maintaining balance | 2 × 10–15 reps/leg |
| 8 | Floating exercise | Maintain floating position on front and back, with or without support | – |

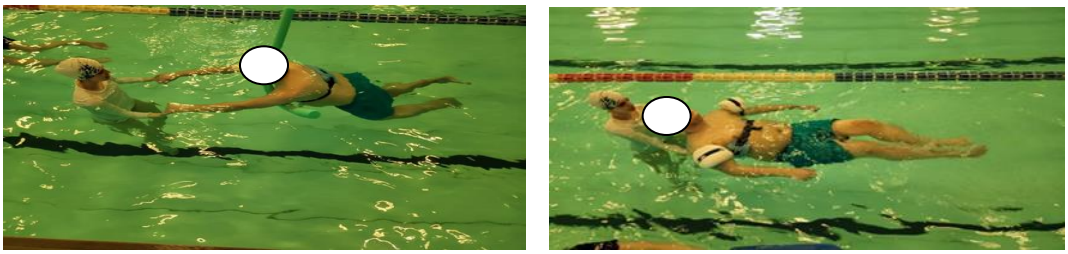

**Figure 1.** *Maintaining the floating position on the front (a) and back (b) with support from the kinesiotherapist*

**Table 3.** *Stage II of the Therapeutic Program*

| Element | Description |
|---|---|
| Duration | 4 weeks |
| Session frequency | 1 hydro-kinesiotherapy session/week + dry-land exercises |
| Objectives | Increasing physical effort tolerance<br>Continuing glycemic and blood pressure control<br>Reducing body mass• Improving lipid profile |

**Table 4.** *Exercises in Stage II*

| No. | Exercise | Description | Dosage |
|---|---|---|---|
| 1 | Alternating walking and light running in water | Alternate periods of walking with light running, maintaining controlled breathing | 15–20 minutes |
| 2 | Half-squats with arm adduction and dumbbell raise | Perform a half-squat followed by arm adduction and raising the dumbbell in horizontal adduction | 2–3 × 10–12 reps |
| 3 | Knee-to-chest flexion in water | Alternately lift knees to chest while maintaining balance and moving arms in water | 2 × 15–20 reps/leg |
| 4 | Squats with knee lift and touch | Squat with straight back, return, then alternately lift knees to chest and touch them with hands | 2–3 × 10–15 reps |

**Table 5.** *Stage III of the Therapeutic Program*

| Element | Description |
|---|---|
| Duration | 6 weeks |
| Intensity | Moderate |
| Objectives | Improving cardiovascular endurance<br>Maintaining weight loss and metabolic control<br>Increasing muscle strength |

**Table 6.** *Exercises in Stage III*

| No. | Exercise | Description | Dosage |
|---|---|---|---|
| 1 | Brisk walking or swimming | Brisk walking in deep water or swimming over longer distances, maintaining consistent pace and breathing | 20–30 min brisk walking or 15–20 min swimming |
| 2 | Water circuit training | Circuit consisting of wall push-ups, leg raises, and dumbbell exercises | 30–40 minutes |

## 3. Results and Discussions

Following the implementation of the individualized hydro-kinesiotherapy program, a positive evolution of the patient's morpho-functional parameters was observed, with significant improvements in exercise capacity, reduction of metabolic risk and maintenance of vital functions within normal limits while doing activities which require an intermediate level of effort.

**Table 7.** *Initial Assessment of the Patient*

| Evaluated Category | Parameter | Value | Observations / Interpretation |
|---|---|---|---|
| Anthropometric Measurements | Height | 182 cm | Stable |
| | Body Mass | 120 kg | Elevated |
| | Waist Circumference | 113 cm | Increased metabolic risk |
| | BMI | 36.2 | Grade II obesity |
| Exercise Capacity Assessment | Squats in 30 seconds | 12 reps | Reduced exercise capacity |
| Cardiac Function Assessment | Resting Heart Rate | 70–80 bpm | Regular rhythm |
| | Heart Rate after Exercise | 90–100 bpm | Normal post-exercise increase |
| Respiratory Function Assessment | Respiratory Rate | 16–18 breaths/min | Values within normal limits |

At the initial assessment, the patient's body mass was 120kg, resulting in a BMI of 36.2, and thus classifying as grade II obesity. The waist circumference measured 113cm, indicating an increased metabolic risk, commonly associated with metabolic syndrome, type 2 diabetes, and cardiovascular diseases. Exercise capacity was evaluated by the number of squats performed in 30 sec., with a result of 12 repetitions, reflecting low physical capacity and limited muscular endurance.

Cardiac function at rest was normal, with a heart rate of 70-80bpm and regular rhythm, while after exercise it increased moderately to 90-100bpm, indicating a normal physiological response to exertion.

Respiratory function was assessed via respiratory rate, which ranged between 16-18 breaths/min., values considered within normal limits for an adult. The initial evaluation indicates a patient with grade II obesity and reduced physical endurance, but with normal cardiac and respiratory functions. This provides a clear baseline for implementing a well - structured kinesiotherapy oriented prophylaxis program aimed at improving metabolic and physical health.

**Table 6.** *Intermediate Assessment Values of the Patient*

| **Date** | **08/03/2024** | **18/03/2024** | **29/03/2024** | **09/04/2024** | **19/04/2024** | **26/04/2024** | **06/05/2024** |
|---|---|---|---|---|---|---|---|
| Body Mass (kg) | 118 | 115 | 112 | 110 | 105 | 107 | 103 |
| BMI (kg/m²) | 35.6 | 34.7 | 33.8 | 33.1 | 31.7 | 32.3 | 31.1 |
| Waist Circumference (cm) | 111 | 110 | 108 | 107 | 104 | 105 | 103 |

The intermediate assessments conducted between March 8$^{th}$ and May 6$^{th}$, 2024, showed a progressive decrease in body mass, BMI and waist circumference, indicating a positive response to the program. The patient's body mass decreased from 118kg to 103kg, representing a total loss of 15kg over the monitored period. This decrease reflects a consistent weight loss, demonstrating the body's capacity of adaptating to the physical activity and the lifestyle changes.

The BMI decreased from 35.6kg/m² to 31.1kg/m², indicating a reduction in obesity-related risk. Although the patient remains overweight at the end of the period, the progress is significant and aiming towards normal limits. Waist circumference decreased from 111cm to 103cm, reflecting a reduction in visceral fat and, consequently, metabolic risk.

This change is particularly important as abdominal circumference is a relevant indicator of risk for metabolic syndrome and cardiovascular conditions.

**Table 7.** *Final Assessment of the Patient*

| Evaluated Category | Parameter | Value | Observations / Interpretation |
|---|---|---|---|
| Anthropometric Measurements | Height | 182 cm | Stable |
| | Body Mass | 95 kg | Significant decrease |
| | Waist Circumference | 95 cm | Reduced metabolic risk |
| | BMI | 28.7 | Overweight (decreased from grade II obesity) |
| Exercise Capacity Assessment | Squats in 30 seconds | 20 reps | Significant increase in physical capacity |
| Cardiac Function Assessment | Resting Heart Rate | 70–80 bpm | Regular rhythm, no changes |
| | Heart Rate after Exercise | 90–100 bpm | Normal post-exercise increase |
| Respiratory Function Assessment | Respiratory Rate | 16–18 breaths/min | Values within normal limits |

At the final assessment, the patient showed a significant reduction in body mass to 95kg, representing a decrease of 25kg compared to the initial assessment. This change resulted in a BMI of 28.7kg/m², classifying the patient as overweight, a notable improvement from the initial grade II obesity. Waist circumference decreased to 95cm, indicating a reduction in visceral fat and metabolic risk, serving as a positive indicator of the effectiveness of the program and lifestyle interventions. Exercise capacity improved significantly, the patient being able to perform 20 squats in 30 seconds, compared to 12 at the initial assessment, reflecting a considerable increase in endurance and muscle strength. Cardiac function remained within normal limits, with a resting heart rate between 70-80bpm and post-exercise heart rate between 90-100bpm, indicating a regular rhythm and normal physiological adaptation to physical activity. Respiratory function remained stable, with a rate of 16-18 breaths/min.

Comparing the patient's initial and final assessments, significant progress can be observed in anthropometric parameters and physical capacity. Body mass decreased from 120kg to 95kg, representing a total 25kg loss. BMI decreased from 36.2kg/m² to 28.7kg/m², marking a transition from grade II obesity to overweight. Waist circumference decreased from 113cm to 95cm, reducing the metabolic risk associated with metabolic syndrome and cardiovascular complications.

The number of squats performed in 30 seconds increased from 12 to 20, reflecting a considerable improvement in muscular endurance and overall physical capacity. Resting heart rate (70-80bpm) and post-exercise heart rate (90-100bpm) remained constant, indicating normal cardiovascular adaptation to the exercise

program. Respiratory rate (16-18 breaths/min.) also remained stable and within normal limits.

**Table 8.** *Comparison of the Patient's Initial and Final Values*

| Evaluated Category | Parameter | Initial Value | Final Value | Difference / Progress |
|---|---|---|---|---|
| Anthropometric Measurements | Height | 182 cm | 182 cm | (constant) |
| | Body Mass | 120 kg | 95 kg | 25 kg (significant decrease) |
| | Waist Circumference | 113 cm | 95 cm | 18 cm (reduced metabolic risk) |
| | BMI | 36.2 | 28.7 | Decrease of 7.5 - from grade II obesity to overweight |
| Exercise Capacity Assessment | Squats in 30 seconds | 12 reps | 20 reps | 8 reps (significant increase in endurance) |
| Cardiac Function Assessment | Resting Heart Rate | 70–80 bpm | 70–80 bpm | (maintained) |
| | Heart Rate after Exercise | 90–100 bpm | 90–100 bpm | (maintained) |
| Respiratory Function Assessment | Respiratory Rate | 16–18 breaths/min | 16–18 breaths/min | (maintained) |

The individualized hydro-kinesiotherapy program led to significant body changes in regards to weight and waist circumference, increased exercise capacity, and maintenance of normal vital functions, showing the effectiveness of the intervention on the patient's physical and metabolic health.

***Discussions***

The study by (Agapii, & Savițchi, 2024) confirms that structured physical education programs can significantly improve the somatic parameters of post-COVID-19 adolescents, supporting the role of physical activity in recovery and health maintenance. These results are consistent with those reported by (Kahl, 2015), which highlight the association between metabolic syndrome, mental health, and physical activity levels in populations at risk for type 2 diabetes. Physical therapy interventions can help increase activity levels in psychiatric patients, as shown by study (Gyllensten, Ovesson, Hedlund, Ambrus, & Tornberg, 2019). Moreover, physical exercise contributes to improvements in cognitive performance and psychological well-being in patients with schizophrenia treated with clozapine (Koç, & Akbuğa Koç, 2025). Studies (Hjorth, Davidsen, Kilian, & Skrubbeltrang, 2014) indicate weight reduction and improved physical health parameters in

patients with schizophrenia participating in exercise programs.

## 4. Conclusions

The implementation of an individualized hydro-kinesiotherapy program led to significant improvements in the morpho-functional, physical, and metabolic parameters of a patient with schizophrenia and metabolic syndrome. The interventions promoted a reduction in metabolic risk, increased physical capacity, and maintenance of vital functions within normal limits, demonstrating the body's ability to adapt to structured exercise. The results confirm the effectiveness of personalized physical exercise programs and highlight the importance of integrating them within a multidisciplinary framework, emphasizing the role of physical activity in supporting both physical and mental health in patients with severe psychiatric disorders.

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