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# GAP BETWEEN SPONTANEOUS AWARENESS, SELF-REPORTED USE OF PHYSICAL ACTIVITY AS A PREVENTIVE MEASURE, AND QUESTIONNAIRE-ASSESSED MOVEMENT BEHAVIOUR AFTER MYOCARDIAL INFARCTION: A CROSS-SECTIONAL ANALYSIS OF A STRATIFIED RANDOM SAMPLE

# РОЗРИВ МІЖ СПОНТАННОЮ ОБІЗНАНІСТЮ, ЗАЯВЛЕНИМ ЗАСТОСУВАННЯМ ФІЗИЧНОЇ АКТИВНОСТІ ЯК ПРОФІЛАКТИЧНОГО ЗАХОДУ ТА АНКЕТНО ВИЗНАЧЕНОЮ РУХОВОЮ ПОВЕДІНКОЮ ПІСЛЯ ІНФАРКТУ МІОКАРДА: ПЕРЕХРЕСНИЙ АНАЛІЗ СТРАТИФІКОВАНОЇ ВИПАДКОВОЇ ВИБІРКИ

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**Abstracts**

**Objective.** To determine the discrepancy and degree of agreement between spontaneous awareness, self-reported adherence, and questionnaire-assessed physical activity in patients during long-term follow-up after myocardial infarction, and to identify independent informational, sociodemographic, and clinical factors associated with engagement in approximately 30 minutes of continuous physical activity.

**Materials and Methods.** A secondary cross-sectional analysis was conducted on a stratified proportional random sample of 333 patients following myocardial infarction. Spontaneous awareness was assessed using an open-ended question; self-reported behavioural adherence was evaluated based on spontaneously reported preventive measures that patients were actually implementing. Daily walking, approximately 30 minutes of continuous purposeful physical activity, barriers, and the doctor's recommendation regarding exercise were assessed separately. The primary outcome was engagement in approximately 30 minutes of continuous purposeful physical activity. Independent associations were assessed using modified Poisson regression.

**Results.** Data regarding approximately 30 minutes of continuous purposeful physical activity were available for 315 patients; 98 of these were active – 31.1% (95% CI 26.3–36.4%). At the same time, 240 out of 333 participants (72.1%) reported walking for at least 30 minutes a day. The largest behavioural group consisted of patients who walked for ≥30 minutes but did not engage in 30 minutes of purposeful physical activity – 48.6%. Overall, 14.3% of participants spontaneously identified physical activity as a means of secondary prevention, whilst 11.2% spontaneously reported actually using it as a preventive measure. The agreement between these indicators was low: $\kappa = 0.237$; positive agreement was 33.3%, and negative agreement was 90.2%. Spontaneous awareness was associated with a higher prevalence of purposeful physical activity: adjusted prevalence ratio 1.46 (95% CI 1.01–2.13; $p = 0.047$). Receiving a doctor's recommendation showed a stronger association: 1.97 (1.27–3.05; $p = 0.002$). Diabetes mellitus was associated with lower activity levels: 0.46 (0.23–0.96; $p = 0.037$). The main barriers were health status – 45.6%, lack of willpower – 32.1%, lack of time – 13.5%, and underestimating the benefits of exercise – 10.2%.

**Conclusions.** In the long-term period following myocardial infarction, a discrepancy was found between everyday walking, spontaneous awareness of the preventive role of physical activity, self-reported use of physical activity as a preventive measure, and engagement in approximately 30 minutes of continuous purposeful activity. A doctor's recommendation was associated with a higher prevalence of such activity; however, the cross-sectional design does not allow for the establishment of causality.

**Keywords:** myocardial infarction, secondary prevention, physical activity, awareness, adherence, behavioural risk factors, cardiac rehabilitation, physiotherapy, barriers.

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**Мета.** Визначити розрив і ступінь узгодженості між спонтанною обізнаністю, заявленою прихильністю та анкетно визначеною фізичною активністю у пацієнтів у віддаленому періоді після інфаркту міокарда, а також встановити незалежні інформаційні, соціально-демографічні та клінічні чинники виконання приблизно 30 хвилин безперервної фізичної активності.

**Матеріали та методи.** Проведено вторинний перехресний аналіз стратифікованої пропорційної випадкової вибірки 333 пацієнтів після інфаркту міокарда. Спонтанну обізнаність оцінювали за відкритим питанням; заявлену поведінкову прихильність – за спонтанно названими фактично застосовуваними профілактичними заходами. Окремо оцінювали щоденну ходьбу, приблизно 30 хвилин безперервної цілеспрямованої фізичної активності, бар'єри та рекомендацію лікаря щодо вправ. Первинним результатом було виконання приблизно 30 хвилин безперервної цілеспрямованої фізичної активності. Незалежні асоціації оцінювали модифікованою регресією Пуассона.

**Результати.** Виконання приблизно 30 хвилин безперервної цілеспрямованої фізичної активності було валідно оцінено у 315 пацієнтів; 98 із них були активними – 31,1% (95% ДІ 26,3–36,4%). Водночас 240 із 333 учасників (72,1%) повідомляли про ходьбу щонайменше 30 хвилин на добу. Найбільшу поведінкову групу становили пацієнти, які ходили ≥30 хвилин, але не виконували цілеспрямованої 30-хвилинної активності – 48,6%. Спонтанно назвали фізичну активність способом вторинної профілактики 14,3% учасників, а 11,2% спонтанно повідомили про її фактичне застосування як профілактичного заходу. Узгодженість між цими показниками була низькою: к=0,237; позитивна узгодженість – 33,3%, негативна – 90,2%. Спонтанна обізнаність асоціювалася з вищою поширеністю цілеспрямованої активності: скориговане відношення поширеностей 1,46 (95% ДІ 1,01–2,13; p=0,047). Отримання рекомендації лікаря мало стійкішу асоціацію: 1,97 (1,27–3,05; p=0,002). Цукровий діабет асоціювався з нижчою активністю: 0,46 (0,23–0,96; p=0,037). Основними бар'єрами були стан здоров'я – 45,6%, недостатня сила волі – 32,1%, нестача часу – 13,5% і недооцінювання користі вправ – 10,2%.

**Висновки.** У віддаленому періоді після інфаркту міокарда виявлено невідповідність між повсякденною ходьбою, спонтанним усвідомленням профілактичної ролі фізичної активності, заявленим застосуванням фізичної активності як профілактичного заходу та виконанням приблизно 30 хвилин безперервної цілеспрямованої активності. Рекомендація лікаря була асоційована з більшою поширеністю такої активності, однак перехресний дизайн не дозволяє встановити причинність.

**Ключові слова:** інфаркт міокарда, вторинна профілактика, фізична активність, обізнаність, прихильність, поведінкові фактори ризику, кардіологічна реабілітація, фізична терапія, бар'єри.

## 1. Introduction

Cardiovascular diseases remain the leading cause of premature mortality, and following myocardial infarction, the long-term risk of recurrent events depends to a large extent on the quality of secondary prevention. Even in healthcare systems with substantial resources, significant gaps persist in the implementation of lifestyle recommendations and participation in cardiac rehabilitation [3].

Secondary prevention following myocardial infarction involves not only optimising drug therapy but also systematically modifying behavioural risk factors. Current guidelines from the European Society of Cardiology define comprehensive cardiac rehabilitation as the priority approach for implementing secondary prevention following acute coronary syndrome. Its main components are assessment of the patient's condition, management of cardiovascular risk factors, advice on physical activity, personalised exercise programmes, dietary adjustments, smoking cessation, patient education, and psychosocial support. Physical activity within this framework is not an isolated recommendation, but rather part of a comprehensive, long-term strategy aimed at reducing the risk of recurrent cardiovascular events and hospitalisations [4].

Despite the availability of evidence-based recommendations, their implementation in actual clinical practice remains inadequate. In the international INTERASPIRE study, which involved 4,548 patients with coronary heart disease across 14 countries in six World Health Organisation regions, only 9.0% of participants reported taking part in a cardiac rehabilitation programme, and only 1.0% met the comprehensive criterion defined by the authors for optimal adherence to secondary prevention guidelines. The study also demonstrated significant heterogeneity in the control of risk factors between countries and at the individual level. Consequently, the failure to implement recommendations is not limited to individual healthcare systems but constitutes a global problem in the secondary prevention of coronary heart disease [16].

Adherence to secondary prevention encompasses pharmacological and non-pharmacological interventions, including changes in physical activity, diet, smoking, alcohol consumption, weight management, and stress management. The clinical consensus of the European Association for Preventive Cardiology emphasises that optimising adherence requires structured, multi-component interventions, interprofessional collaboration, systematic training, and active patient involvement in the development of the treatment plan. This means that the mere provision of a recommendation is not a sufficient indicator of its uptake or implementation: gaps may exist between a healthcare professional's recommendation, the patient's understanding of its preventive significance, their stated willingness to change behaviour, and their actual behavioural practice [17].

A patient's ability to receive, understand, and apply health information is clinically significant for secondary prevention. According to the results of a systematic review and meta-analysis, the average prevalence of limited health literacy among patients with cardiovascular disease was 32.8%; a lower level of health literacy was associated with adverse clinical outcomes and poorer quality of life. At the same time, spontaneous recall of knowledge about individual risk factors is not equivalent to a validated assessment of health literacy, but may characterise one of the cognitive stages in the transition from received information to preventive behaviour. It remains unclear to what extent spontaneous awareness in patients following myocardial infarction correlates with their self-reported adherence and questionnaire-assessed physical activity [11].

Over the last decade, practical recommendations and effectiveness indicators for the secondary prevention of ischaemic heart disease have increasingly been based on evidence from lifestyle interventions, including a balanced diet, regular physical exercise, smoking cessation, weight management, depression screening, and participation in cardiac rehabilitation [3].

Reforms to Ukraine's healthcare system envisage the implementation and integration of best European practices and new technologies for the diagnosis and treatment of cardiovascular diseases, and necessitate the search for new approaches and the modification of existing ones for the primary and secondary prevention of cardiovascular diseases. Significant progress has been made in this area in recent years. However, the results of modern treatment are often undermined by inadequate secondary prevention. As demonstrated in an international study on the state of secondary prevention, the mortality rate among patients following myocardial infarction in Lutsk over a 3.5-year period was 14%, whilst in Gdansk (Poland) it was 8.5% and in Bern (Switzerland) 4.6%. Analysis revealed that the main cause was an unacceptably low level of secondary prevention and the virtual absence of modern rehabilitation measures in the Ukrainian city [9].

**The aim of the study was** to determine the discrepancy and the degree of agreement between spontaneous awareness, self-reported adherence, and questionnaire-assessed physical activity in patients during long-term follow-up after myocardial infarction, as well as to identify independent informational, sociodemographic, and clinical factors associated with performing approximately 30 minutes of continuous physical activity daily.

## 2. Materials and methods

A secondary cross-sectional analysis was conducted on data from a stratified proportional random sample of patients during long-term follow-up after myocardial infarction (MI).

Descriptive statistics on spontaneous awareness and reported use of specific secondary prevention measures had previously been published for this sample. The present study is a new secondary analysis focusing on questionnaire-assessed physical activity, behavioural barriers, the consistency of preventive behaviours across different levels, and their multifactorial associations [22].

The manuscript was prepared in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies [23].

The initial cohort comprised 912 patients undergoing treatment for MI. From this cohort, a stratified proportional random sample was drawn, taking into account sex and age: under 65 years and 65 years or older. The current analysis included 333 patients with documented MI and available questionnaire results.

All included patients had suffered a myocardial infarction between 0.5 and 7.0 years prior to the survey. Patients with a combined history of MI and stroke were not excluded from the main sample: 273 participants had an isolated MI, whilst 60 had an MI combined with a stroke. The concomitant stroke was considered as a covariate in the multivariate analysis and was tested separately in the sensitivity analysis.

The inclusion criteria for this secondary analysis were: a documented history of MI; inclusion in the established stratified random sample; a completed questionnaire; and the provision of written informed consent.

The study was conducted at the Department of the "Lutsk City Territorial Community Medical Association" public enterprise.

Data were collected using the authors' structured questionnaire "Assessment of the Quality of Secondary Prevention of Cardiovascular Disease" [2].

As the participants were during long-term follow-up following the index event, the interviews were conducted at their place of residence. The interviewer read out the questions in accordance with standardised instructions for each item. The patient answered independently in the presence of the interviewer. For some questions, the answer options were read out, whilst for questions regarding awareness and the use of preventive measures, spontaneous answers were expected without demonstrating or reading out a list of options. Multiple answers were permitted where the structure of the question allowed for this.

If a patient was unable to answer a question independently, the answer could be obtained with the assistance of a close relative, with the reason for this being documented. There was no time limit on the duration of the interview.

Spontaneous awareness of secondary prevention factors was assessed using the question: "How can the risk of a recurrent heart attack or stroke be reduced?" The response options were: 1) taking medication regularly; 2) lowering blood pressure in cases of hypertension; 3) reducing fat intake; 4) eating fruit and vegetables regularly; 5) giving up smoking; 6) reducing alcohol consumption; 7) increasing physical activity; 8) losing weight if overweight; 9) avoiding stress; 10) other; 11) I don't know. Instructions for the interviewer: do not read out the answers or show the written responses. Multiple answers may be given. Wait for the patient's spontaneous response. Write any other answers below in column No. 10. If the patient answers "diet", ask which foods should be limited and which should be consumed more, and note the column number, or add this under "other" (No. 10).

For the current analysis, seven response options (3-9) were considered as behavioural components.

The primary informational exposure was the presence of spontaneously mentioned increased physical activity as a means of reducing the risk of recurrent MI.

In addition, a spontaneous awareness index was calculated as the sum of the seven behavioural components (answers 3-9). The index could range from 0 to 7 points. Regular medication use, blood pressure monitoring, the "other" response, and the "don't know" response were not included in the index. This index was regarded as a quantitative measure of the breadth of behavioural awareness, rather than as a reflective psychometric scale.

Self-reported adherence to cardiovascular disease prevention was assessed using the question: "Do you use any methods to prevent cardiovascular disease, that is, do you do anything to reduce the risk of developing or worsening these conditions?" The response options were: 1) yes; 2) no.

If the answer was "yes", a follow-up question was asked to assess the nature of the preventive behaviour: "What methods do you use to prevent heart disease?" The response options were: 1) taking medication regularly; 2) lowering blood pressure in cases of hypertension; 3) reducing fat intake; 4) eating fruit and vegetables regularly; 5) giving up smoking; 6) reducing alcohol consumption; 7) increasing physical activity; 8) losing weight if overweight; 9) avoiding stress; 10) other. Instructions for the interviewer: do not read out the answers or show the answer card. Wait for the patient's spontaneous response. You may note down several answers. Ensure that you have understood the patient. If the patient answers "diet", ask which foods they are restricting and which they are eating more of, and make a note of this. Record other answers in the "10) other" column.

Reported commitment to increasing physical activity was determined by the presence of the answer "7) increasing physical activity". This indicator was interpreted as a spontaneous

statement about physical activity specifically as a method of secondary prevention, rather than as a direct assessment of the actual level of activity.

The association between commitment and awareness was assessed using the same seven behavioural components (answers 3–9).

The index of reported behavioural adherence was calculated as the sum of responses 3–9, ranging from 0 to 7 points. If a patient answered "no" to the question "Do you use any methods of preventing cardiovascular disease, that is, do you do anything to reduce the risk of developing or worsening these conditions?" and consequently did not proceed to the question "What methods of preventing heart disease do you use?", all seven behavioural components were coded as zeros.

In total, the question regarding actually practised prevention methods was initially completed by 299 participants. For the 30 patients who reported that they did not practise any prevention methods, the seven behavioural components were coded as structural zeros; therefore, the main analytical denominator for reported behavioural adherence was 329. Four cases in which patients reported using prevention measures but did not specify particular methods were excluded from the main paired analysis of awareness and adherence.

The duration of daily walking was assessed using the question "How much time do you spend walking outdoors during the day?" (single response): less than 15 minutes; 15–30 minutes; 30–60 minutes; more than 60 minutes.

In addition, a dichotomous indicator of walking for at least 30 minutes per day was derived by combining responses 3 and 4. This indicator was regarded as an approximate self-reported estimate rather than precise confirmation of meeting the physical activity guideline.

Assessment of purposeful 30-minute physical activity was carried out using the question: "Do you engage in physical exercise or other physical activity (cycling, swimming, gymnastics, etc.) for approximately 30 minutes without a break?" The response options were: 1) yes; 2) no. If the interviewer observed a marked gait disturbance, such as lower limb paresis, the set of questions regarding purposeful activity, its frequency, and barriers was not asked. Statistically, such cases were defined as structural omissions rather than as a lack of physical activity. The measure was assessed in 315 patients; in 18 participants, it was not assessed due to functional limitations. In the primary analysis, these 18 cases were excluded from the model; in the conservative sensitivity analysis, they were coded as a lack of 30-minute activity.

The frequency of organised physical activity was assessed using the question: "How often do you do exercises lasting about 30 minutes? Please select only one answer that best applies." The response options were: 1) every day; 2) 4–6 times a week; 3) 2–3 times a week; 4) once a week; 5) 2–3 times a month.

In addition, a measure of high frequency of purposeful physical activity was developed, which included exercising daily or 4–6 times a week. Frequency was analysed only amongst patients who reported engaging in approximately 30 minutes of continuous activity. Valid data on frequency were available for 96 out of 98 such participants.

The presence of heavy physical labour was assessed using the question: "Do you ever find yourself doing heavy work for several hours a day (gardening, playing sport, etc.)?" The response options were: 1) yes; 2) no; 3) hard to say. This measure was used descriptively, as it could reflect occupational or domestic activities rather than specifically organised physical exercise.

Physical activity profiles. Four mutually exclusive physical activity profiles were identified: 1) engaged in purposeful physical activity – engaging in organised physical activity for approximately 30 minutes without a break; 2) walking without specifically organised exercise – walking only for at least 30 minutes a day; 3) low activity – only walking for less than 30 minutes a day; 4) activity not assessed due to functional limitations.

Barriers to physical activity were assessed based on the question: "Why do you not exercise?" The response options were read out, and multiple choices were permitted: 1) I don't have time; 2) I don't think it will help my health; 3) I don't have the willpower to make myself do it; 4) due to my health (it's difficult to exercise); 5) other.

Each barrier was coded as a separate binary variable. Barriers were analysed among 215 patients who did not engage in 30 minutes of purposeful physical activity and provided a valid response regarding their reasons. As multiple answers were permitted, the total percentage could exceed 100%.

Doctor's recommendation regarding physical activity was determined by the question: “Has your doctor recommended that you:” 1) follow a diet (eat less sugary and fatty food); 2) take part in physical exercise; 3) eat less salty food; 4) smoke less or give up smoking; 5) drink less alcohol; 6) avoid stress. The patient was read a list of possible doctor's recommendations, after which they indicated “yes” or “no” for each one. Multiple responses were possible.

The response option “2) take part in physical exercise” was coded as follows: 1 – the doctor recommended physical exercise; 0 – no such recommendation was given. This response option was the key secondary exposure and was also included in the primary adjusted model.

The pre-specified covariates for the primary model were: age, categorised in 10–year intervals; sex; educational attainment; history of a previous stroke; diabetes mellitus; obesity; a doctor's recommendation regarding physical exercise; and spontaneous awareness of the preventive role of physical activity.

Educational attainment was categorised into three groups: low – primary or incomplete secondary education; medium – complete secondary or vocational secondary education; high – incomplete higher or higher education.

The medium level of education was used as the reference category. Diabetes mellitus was identified from the corresponding questionnaire item. Obesity was defined as a body mass index (BMI) of $\geq 30$ kg/m².

In the extended sensitivity analysis, occupational status, income category, and time elapsed since the index event were additionally taken into account. In a separate model, obesity based on body mass index was replaced by abdominal obesity, determined by waist circumference.

## 3. Statistical analysis

Quantitative measures are presented as the mean and standard deviation (Mean ± SD), or as the median with first and third quartiles (Me [Q1; Q3]). Categorical measures are presented as n/N (%). For proportions, 95% confidence intervals were calculated using Wilson's method. To describe the magnitude of between-group differences, the standardised mean difference (SMD) was used: for quantitative measures, this was calculated based on the means and pooled standard deviation; for categorical measures, it was calculated as the standardised difference in proportions. Covariates for the multivariate model were determined a priori based on clinical and contextual relevance.

Patient characteristics were described separately for: participants who engaged in specifically organised physical activity for at least 30 minutes; participants who did not engage in specifically organised physical activity; and participants for whom this question was not assessed due to functional limitations.

Primary model. We assessed the association between spontaneous awareness of the preventive role of physical activity and engagement in approximately 30 minutes of continuous purposeful activity using modified Poisson regression with a logarithmic link and robust standard errors.

The adjusted model simultaneously included spontaneous awareness of physical activity, a doctor's recommendation regarding exercise, age (in 10-year intervals), sex, educational level, previous stroke, diabetes mellitus, and obesity as measured by body mass index. The analysis was restricted to complete cases. The analysis included 314 patients, 98 of whom reported participating in a specifically organised 30-minute session of physical activity.

Results were expressed as prevalence ratios (PRs) and adjusted prevalence ratios (aPRs) with 95% confidence intervals and two-sided p-values. The primary confirmatory test was the adjusted coefficient of spontaneous awareness regarding the preventive role of physical activity.

The agreement between spontaneous awareness and reported behavioural adherence was assessed for seven behavioural components among 329 participants. For each component, the difference in prevalence, the exact McNemar's test, Cohen's $\kappa$ coefficient of agreement, and positive and negative agreement were calculated. 95% confidence intervals for $\kappa$ were obtained via bootstrap analysis with 5,000 repetitions; for the seven comparisons, the Benjamini-Hochberg correction was applied with a false discovery rate threshold of 5%.

The study was conducted in accordance with the principles of the World Medical Association's Declaration of Helsinki regarding the ethical principles of medical research involving human subjects. All patients were informed of the aim, content, and procedures of the study and provided

written informed consent to participate. The level of statistical significance was set at $p < 0.05$.

The study design, protocol, criteria for selecting participants, and the written consent forms were approved by the Bioethics Committee of the Academy of Recreational Technologies and Law (Protocol No. 4 of 19 April 2023).

***Table 1***

**Patient characteristics according to participation in a specifically organised 30-minute physical activity session**

| Variable | Overall, n=333 | Yes – engaged in 30-minute activity, n=98 | No – not engaged in 30-minute activity, n=217 | Not assessed for 30-minute activity, n=18 | SMD: yes vs no |
|---|---|---|---|---|---|
| Age, years | 62.5±9.8 | 62.0±10.1 | 62.1±9.6 | 69.3±7.6 | −0.012 |
| Women | 99/333 (29.7%) | 27/98 (27.6%) | 63/217 (29.0%) | 9/18 (50.0%) | −0.033 |
| Education: below secondary level | 44/333 (13.2%) | 15/98 (15.3%) | 24/217 (11.1%) | 5/18 (27.8%) | 0.126 |
| Education: secondary | 191/333 (57.4%) | 47/98 (48.0%) | 136/217 (62.7%) | 8/18 (44.4%) | −0.299 |
| Education: higher | 98/333 (29.4%) | 36/98 (36.7%) | 57/217 (26.3%) | 5/18 (27.8%) | 0.227 |
| Married | 240/333 (72.1%) | 70/98 (71.4%) | 157/217 (72.4%) | 13/18 (72.2%) | −0.021 |
| Employed | 69/333 (20.7%) | 21/98 (21.4%) | 48/217 (22.1%) | 0/18 (0.0%) | −0.017 |
| Low income | 22/333 (6.6%) | 3/98 (3.1%) | 19/217 (8.8%) | 0/18 (0.0%) | −0.243 |
| Average income | 231/333 (69.4%) | 67/98 (68.4%) | 147/217 (67.7%) | 17/18 (94.4%) | 0.013 |
| High income | 48/333 (14.4%) | 15/98 (15.3%) | 33/217 (15.2%) | 0/18 (0.0%) | 0.003 |
| Did not provide information on income | 32/333 (9.6%) | 13/98 (13.3%) | 18/217 (8.3%) | 1/18 (5.6%) | 0.161 |
| Time since the index event, years | 2.0 [1.0; 4.0], n=312 | 2.0 [1.0; 4.0], n=92 | 2.0 [1.0; 4.0], n=202 | 3.0 [2.0; 4.5] n=18 | 0.025 |
| Concomitant stroke | 60/333 (18.0%) | 16/98 (16.3%) | 33/217 (15.2%) | 11/18 (61.1%) | 0.031 |
| Diabetes mellitus | 46/333 (13.8%) | 6/98 (6.1%) | 33/217 (15.2%) | 7/18 (38.9%) | −0.298 |
| BMI, kg/m² | 29.5±5.0, n=330 | 29.4±4.9 n=98 | 29.5±5.0, n=216 | 31.5±5.0, n=16 | −0.008 |
| Obesity, BMI ≥30 kg/m² | 149/330 (45.2%) | 40/98 (40.8%) | 97/216 (44.9%) | 12/16 (75.0%) | −0.083 |
| Abdominal obesity | 193/332 (58.1%) | 57/98 (58.2%) | 123/216 (56.9%) | 13/18 (72.2%) | 0.025 |
| The doctor recommended physical exercise | 222/333 (66.7%) | 79/98 (80.6%) | 133/217 (61.3%) | 10/18 (55.6%) | 0.436 |
| Aware that physical activity is a means of prevention | 48/333 (14.4%) | 22/98 (22.4%) | 24/217 (11.1%) | 2/18 (11.1%) | 0.309 |
| In favour of increasing physical activity as a preventative measure | 37/329 (11.2%) | 20/97 (20.6%) | 14/214 (6.5%) | 3/18 (16.7%) | 0.42 |
| Awareness index | 1.0 [0.0; 2.0] n=333 | 1.0 [0.0; 2.0] n=98 | 1.0 [0.0; 1.0] n=217 | 0.0 [0.0; 1.8] n=18 | 0.185 |
| Adherence index | 0.0 [0.0; 1.0], n=329 | 0.0 [0.0; 2.0], n=97 | 0.0 [0.0; 1.0], n=214 | 0.0 [0.0; 1.0] n=18 | 0.212 |

## 4. Results and discussion

The secondary analysis included 333 patients during long-term follow-up following myocardial infarction. The mean age of the participants was 62.5 ± 9.8 years; 99 individuals (29.7%) were women. The median time since the index event was 2.0 years (interquartile range: 1.0–4.0) among the 312 patients for whom data were available. Sixty participants (18.0%) had a history of stroke, and 46 (13.8%) had diabetes mellitus. The mean body mass index was 29.5 ± 5.0 kg/m²; obesity was detected in 149 of 330 patients (45.2%), and abdominal obesity in 193 of 332 (58.1%) (Table 1).

Of the 333 participants, the measure of approximately 30 minutes of continuous purposeful physical activity was assessed in 315; 98 patients (31.1%; 95% CI 26.3–36.4%) answered affirmatively. In 18 individuals (5.4% of the total sample), this section was not assessed due to severe functional limitations (Table 1).

The largest standardised differences between patients who did and did not engage in purposeful physical activity were observed for the doctor's recommendation regarding exercise (SMD = 0.436), the reported use of physical activity as a preventive measure (SMD = 0.420), spontaneous awareness (SMD = 0.309), and diabetes mellitus (SMD = −0.298).

Agreement between spontaneous awareness and reported behavioural adherence. The prevalence of spontaneous awareness ranged from 3.0% for reducing excess body weight to 28.9% for managing or avoiding stress. Reported adherence ranged from 2.1% for weight loss to 17.6% for reducing fat intake (Table 2).

Only 14.3% of patients spontaneously mentioned physical activity as a means of secondary prevention, whilst 11.2% reported using it as a preventive measure. Both positive responses were given by 4.3% of participants; 10.0% of patients cited physical activity as a means of prevention but did not report practising it; 7.0% did not mention it during the awareness assessment but reported engaging in the relevant behaviour; 78.7% did not give a positive response to either of the two questions (Table 2).

***Table 2***

**Distribution of paired responses regarding spontaneous awareness and reported behavioural adherence**

| Behavioural factor | Awareness, n/N (%) | Adherence, n/N (%) | Aware and acts, n (%) | Aware, but does not act, n (%) | Does not know, but takes action, n (%) | Does not know and does not take action, n (%) |
|---|---|---|---|---|---|---|
| Reducing fat intake | 55/329 (16.7%) | 58/329 (17.6%) | 31 (9.4%) | 24 (7.3%) | 27 (8.2%) | 247 (75.1%) |
| Regular consumption of fruit and vegetables | 38/329 (11.6%) | 29/329 (8.8%) | 16 (4.9%) | 22 (6.7%) | 13 (4.0%) | 278 (84.5%) |
| Quitting smoking | 53/329 (16.1%) | 33/329 (10.0%) | 20 (6.1%) | 33 (10.0%) | 13 (4.0%) | 263 (79.9%) |
| Reduction in alcohol consumption | 55/329 (16.7%) | 32/329 (9.7%) | 17 (5.2%) | 38 (11.6%) | 15 (4.6%) | 259 (78.7%) |
| Increased physical activity | 47/329 (14.3%) | 37/329 (11.2%) | 14 (4.3%) | 33 (10.0%) | 23 (7.0%) | 259 (78.7%) |
| Weight loss | 10/329 (3.0%) | 7/329 (2.1%) | 2 (0.6%) | 8 (2.4%) | 5 (1.5%) | 314 (95.4%) |
| Managing or avoiding stress | 95/329 (28.9%) | 54/329 (16.4%) | 32 (9.7%) | 63 (19.1%) | 22 (6.7%) | 212 (64.4%) |

***Table 3***

**Agreement between spontaneous awareness and self-reported behavioural adherence**

| Behavioural factor | Δ commitment – awareness, p-value | Cohen 's κ | 95% CI for κ | Positive agreement, % | Negative agreement, % | McNemar's p-value | q BH |
|---|---|---|---|---|---|---|---|
| Reduction in fat intake | 0.9 | 0.455 | 0.327–0.581 | 54.9 | 90.6 | 0.78 | 0.78 |
| Regular consumption of fruit and vegetables | −2.7 | 0.42 | 0.252–0.573 | 47.8 | 94.1 | 0.175 | 0.307 |
| Giving up smoking | −6.1 | 0.39 | 0.246–0.523 | 46.5 | 92 | 0.005 | 0.011 |
| Reduction in alcohol consumption | −7.0 | 0.305 | 0.161–0.438 | 39.1 | 90.7 | 0.002 | 0.008 |
| Increased physical activity | −3.0 | 0.237 | 0.096–0.377 | 33.3 | 90.2 | 0.229 | 0.32 |
| Weight loss | −0.9 | 0.216 | −0.022–0.492 | 23.5 | 98 | 0.581 | 0.678 |
| Stress management or avoidance | −12.5 | 0.279 | 0.169–0.389 | 43 | 83.3 | <0.001 | <0.001 |

*Note: Δ – the difference between the frequency of positive responses regarding attitude and awareness; p.p. – percentage points.*

The highest levels of agreement between spontaneous awareness and self-reported behavioural adherence were found for reducing fat intake and regular consumption of fruit and vegetables. Slightly lower levels of consistency were observed for reducing alcohol consumption and managing stress. The lowest consistency scores were found for weight loss and increased physical activity (Table 3).

Positive agreement regarding physical activity as a means of secondary prevention was 33.3%, whilst negative agreement was 90.2%. The paired difference in prevalence was – 3.0 percentage points; the exact McNemar's test did not reveal a statistically significant difference between the frequencies of positive responses regarding awareness and commitment: p = 0.229; adjusted q = 0.320.

After Benjamini-Hochberg correction, reported adherence was statistically significantly lower than spontaneous awareness regarding smoking cessation – 10.0% versus 16.1% (q = 0.011), reduction in alcohol consumption – 9.7% versus 16.7% (q = 0.008), and managing or avoiding stress – 16.4% versus 28.9% (q<0.001). No statistically significant paired differences were found after adjustment for multiple comparisons regarding reducing fat intake, regular consumption of vegetables and fruit, physical activity, or weight loss.

Physical activity behaviour as determined by the questionnaire depended significantly on the method of measurement (Table 4). Overall, 72.1% of participants reported walking for at least 30 minutes daily, whilst 31.1% of those assessed engaged in approximately 30 minutes of continuous purposeful activity. In the profile-based classification, 48.6% of the full sample walked for ≥30 minutes per day but did not report any specifically organised 30-minute activity. This discrepancy should not be interpreted as evidence of failure to meet physical activity guidelines, as the intensity and total weekly volume of walking were not measured.

***Table 4***

**Characteristics of physical activity and behavioural barriers to adherence**

| Indicators | | n/N | % | 95% CI |
|---|---|---|---|---|
| Duration of daily walking | Less than 15 min | 50/333 | 15.0 | 11.6–19.2 |
| | 15–30 min | 43/333 | 12.9 | 9.7–16.9 |
| | 30–60 min | 75/333 | 22.5 | 18.4–27.3 |
| | Over 60 min | 165/333 | 49.5 | 44.2–54.9 |
| | Walking for ≥30 minutes a day | 240/333 | 72.1 | 67.0–76.6 |
| Continuous, specifically organised physical activity | Yes, approximately 30 minutes without a break | 98/315 | 31.1 | 26.3–36.4 |
| | No | 217/315 | 68.9 | 63.6–73.7 |
| | Not assessed due to functional limitation | 18/333 | 5.4 | 3.4–8.4 |
| Frequency of specifically organised 30-minute activity | Daily | 52/96 | 54.2 | 44.2–63.8 |
| | 4–6 times a week | 11/96 | 11.5 | 6.5–19.4 |
| | 2–3 times a week | 15/96 | 15.6 | 9.7–24.2 |
| | Once a week | 7/96 | 7.3 | 3.6–14.3 |
| | 2–3 times a month | 11/96 | 11.5 | 6.5–19.4 |
| | Daily or 4–6 times a week | 63/96 | 65.6 | 55.7–74.4 |
| Several hours of heavy physical labour | Yes | 89/313 | 28.4 | 23.7–33.7 |
| | No | 214/313 | 68.4 | 63.0–73.3 |
| | Hard to say | 10/313 | 3.2 | 1.7–5.8 |
| | Complete cases | 2/315 | 0.6 | 0.2–2.3 |
| | Missing data | 18/333 | 5.4 | 3.4–8.4 |
| Physical activity profiles | Engaged in specifically organised exercises | 98/333 | 29.4 | 24.8–34.5 |
| | Walking for ≥30 minutes without specially organised exercise | 162/333 | 48.6 | 43.3–54.0 |
| | Low activity | 55/333 | 16.5 | 12.9–20.9 |
| | Activity not assessed due to functional limitation | 18/333 | 5.4 | 3.4–8.4 |
| Barriers to adherence among patients without a specifically organised 30-minute activity session | Health status makes it difficult to take part | 98/215 | 45.6 | 39.1–52.3 |
| | Lack of willpower | 69/215 | 32.1 | 26.2–38.6 |
| | Not enough time | 29/215 | 13.5 | 9.6–18.7 |
| | Does not believe that exercise is beneficial to health | 22/215 | 10.2 | 6.9–15.0 |
| | Other reason | 8/215 | 3.7 | 1.9–7.2 |
| Number of adherence barriers reported | 0 | 0/215 | 0 | 0.0–1.8 |
| | 1 | 205/215 | 95.3 | 91.7–97.5 |
| | 2 | 9/215 | 4.2 | 2.2–7.8 |
| | 3 | 1/215 | 0.5 | 0.1–2.6 |

***Table 5***

**Unadjusted and adjusted factors associated with engaging in 30 minutes of purposeful physical activity**

| Factor | | n/N (%) | PR (95% CI) | p | aPR (95% CI) | p |
|---|---|---|---|---|---|---|
| Spontaneous awareness of physical activity | No | 76/268 (28.4%) | 1.00, ref. | – | 1.00, ref. | – |
| | Yes | 22/46 (47.8%) | 1.69 (1.18–2.41) | 0.004 | 1.46 (1.01–2.13) | 0.047 |
| Doctor's recommendation regarding physical exercise | No | 19/102 (18.6%) | 1.00, ref. | – | 1.00, ref. | – |
| | Yes | 79/212 (37.3%) | 2.00 (1.29–3.11) | 0.002 | 1.97 (1.27–3.05) | 0.002 |
| Age | For every 10 years | – | 1.00 (0.84–1.18) | 0.962 | 0.95 (0.80–1.14) | 0.604 |
| Sex | Men | 71/224 (31.7%) | 1.00, ref. | – | 1.00, ref. | – |
| | Women | 27/90 (30.0%) | 0.95 (0.65–1.37) | 0.77 | 1.18 (0.79–1.77) | 0.426 |
| Education | Secondary | 47/182 (25.8%) | 1.00, ref. | – | 1.00, ref. | – |
| | Low | 15/39 (38.5%) | 1.49 (0.93–2.38) | 0.095 | 1.73 (1.07–2.79) | 0.025 |
| | Higher | 36/93 (38.7%) | 1.50 (1.05–2.14) | 0.025 | 1.41 (1.00–2.00) | 0.05 |
| Concomitant stroke | No | 82/265 (30.9%) | 1.00, ref. | – | 1.00, ref. | – |
| | Yes | 16/49 (32.7%) | 1.06 (0.68–1.64) | 0.811 | 1.11 (0.70–1.75) | 0.656 |
| Diabetes mellitus | No | 92/276 (33.3%) | 1.00, ref. | – | 1.00, ref. | – |
| | Yes | 6/38 (15.8%) | 0.47 (0.22–1.01) | 0.052 | 0.46 (0.23–0.96) | 0.037 |
| Obesity, BMI ≥30 kg/m² | No | 58/177 (32.8%) | 1.00, ref. | – | 1.00, ref. | – |
| | Yes | 40/137 (29.2%) | 0.89 (0.64–1.25) | 0.5 | 0.87 (0.62–1.23) | 0.44 |

*Note: "ref." – reference category.*

Factors associated with engagement in 30 minutes of purposeful physical activity. The initial multifactorial model was constructed based on 314 complete cases, of whom 98 patients reported performing purposeful 30-minute physical activity (Table 5).

In the adjusted model, spontaneous awareness was associated with a higher prevalence of purposeful 30-minute activity (aPR = 1.46; 95% CI 1.01–2.13; p = 0.047). A stronger association was found for a doctor's recommendation regarding exercise (aPR = 1.97; 95% CI 1.27–3.05; p = 0.002). Diabetes mellitus was associated with a lower prevalence of physical activity (aPR = 0.46; 95% CI 0.23–0.96; p = 0.037). Other

estimates are presented in Table 4; they characterise associations rather than causal effects.

In our study, only 31.1% of patients reported engaging in approximately 30 minutes of continuous physical activity, although 72.1% of the total sample stated that they walked for at least 30 minutes a day. The most common behavioural profile was that of patients who reported walking for a sufficient duration but did not engage in specifically organised 30-minute exercise sessions. Spontaneous awareness and self-reported commitment to physical activity showed low positive agreement, indicating a significant individual gap between knowledge and behavioural implementation. Receiving a doctor's recommendation was associated with an almost twofold higher prevalence of purposeful 30-minute activity, whilst the adjusted association for spontaneous awareness was weaker and did not remain statistically significant in all sensitivity analyses. Lower levels of physical activity were observed in patients with diabetes mellitus. The main reasons for not exercising were health-related limitations and a subjective feeling of lacking the willpower to do so.

The lower prevalence of physical activity among patients with diabetes mellitus is consistent with the findings of D. De Bacquer and colleagues: failure to meet physical activity targets was more commonly observed in patients with diabetes, a history of stroke, heart failure, older age, and psychological or emotional problems. In our adjusted model, the presence of diabetes was associated with approximately half the prevalence of 30-minute physical activity. This association may reflect higher comorbidity, functional limitations, excess body weight, peripheral complications, or a more cautious approach to exercise on the part of the patient. At the same time, the cross-sectional design does not allow us to determine the direction of the association: lower activity may be either a consequence of a more complex clinical condition or one of the factors contributing to it [5].

One of the most consistent findings was the association between a doctor's recommendation and purposeful physical activity: after adjusting for age, sex, education, previous stroke, diabetes mellitus, obesity, and spontaneous awareness, adherence to purposeful physical activity was almost twice as high among patients who received exercise recommendations. A similar pattern of association was identified by S. L. Dunn and colleagues in a prospective study of 251 patients with coronary heart disease: the strength of the doctor's recommendation was a unique predictor of home-based physical exercise and was associated with participation in outpatient cardiac rehabilitation. Consequently, it is not only the fact that advice is given that may be important to the patient, but also its clarity, persuasiveness, and specificity. Our questionnaire did not assess the frequency with which the recommendation was repeated, the way it was phrased, the prescribed intensity, or the presence of a written plan; therefore, the observed association likely reflects only part of the actual effect of professional counselling. Due to the observational nature of both studies, the recommendation cannot be interpreted as a proven cause of higher activity levels [6].

Spontaneous awareness of the preventive role of physical activity was associated with purposeful physical activity; however, the association was borderline (aPR = 1.46; 95% CI 1.01–2.13; p = 0.047). In a study by M. Lu et al. involving 598 patients with coronary heart disease in China, adherence to a healthy lifestyle stood at 53.2%, whilst limited health literacy, lower self-efficacy, and insufficient knowledge were associated with non-adherence. This supports the notion that knowledge is one of the necessary but insufficient components of behavioural change: self-efficacy, safety, motivation, habits, social support, and functional capacity all play a role between receiving information and putting it into practice. At the same time, in our study, awareness is not a validated health literacy scale and merely characterises the spontaneous recall of specific preventive knowledge [15].

Further evidence of the need to distinguish between formal education, health literacy, and subject-specific knowledge is provided by the findings of a study by S. H. Shin and M. H. Won. Among 186 patients aged 65 years and over, limited health literacy was found in 66.7% and remained a strong predictor of lower physical activity and more sedentary behaviour after adjusting for sociodemographic and clinical characteristics. In our model, the relationship between formal educational attainment and engagement in physical activity did not follow a linear pattern: compared with those with intermediate educational attainment, higher

activity scores were observed for both lower and higher educational attainment. This result should not be interpreted as an advantage of lower levels of education. It may be a consequence of occupational or domestic activity, heterogeneity within the categories, residual confounding, or random variation. For future studies, it would be advisable to use a separate, validated health literacy instrument, whilst treating education as a sociodemographic covariate [21].

The main barrier to physical exercise in our sample was health status, which made it difficult to exercise; this was cited by 45.6% of patients who did not report any purposeful 30-minute activity. A further 32.1% cited a lack of willpower, 13.5% cited a lack of time, and 10.2% did not believe that exercise would benefit their health. The category "lack of willpower" is not a validated measure of self-efficacy, but may partly reflect a perceived lack of control over behaviour. In a cross-sectional study by S. Kanan and colleagues involving 109 patients with coronary heart disease, it was precisely perceived behavioural control that showed the strongest association with the intention to be physically active; other barriers cited included lack of time, insufficient support, and exhaustion. Consequently, simply informing patients of the benefits of exercise may not be sufficient when they are unsure of their ability to perform it safely in their specific life circumstances [10].

A systematic review by Y. Wang and colleagues, which included 11 studies of patients following myocardial infarction, identified 27 barriers and 23 facilitators to physical rehabilitation; 64% of the factors fell within the individual domain. Barriers described included functional limitations, fatigue, fear of a recurrent event, negative emotions, and a lack of confidence in the safety of the exercise; facilitators included professional counselling, social support, and a personalised plan [24]. A more recent review by X. Zhao and colleagues, which included patients with coronary heart disease, also identifies social influence, beliefs about outcomes, and context/resources as key determinants of adherence to exercise-based rehabilitation [25].

At the same time, the structure of the question regarding barriers to physical activity predominantly covered individual reasons and scarcely assessed organisational barriers. A review by P. Iyngkaran and colleagues showed that participation in cardiac rehabilitation also depends on factors relating to healthcare professionals and the system: referrals, programme availability, transport, geographical remoteness, financial costs, organisation of care, and communication between different levels of care. Therefore, the high prevalence of personal barriers in our results does not imply that systemic issues were less important; they were simply not adequately represented by the response options. In future versions of the questionnaire, it would be advisable to assess separately access to rehabilitation services, the availability of referrals, transport, cost, family support, and contact with a physiotherapist [7].

The heterogeneity of the identified barriers is relevant to the choice of a model for long-term cardiac rehabilitation. In our previous conceptual and methodological study, we proposed a differentiated home-based physiotherapy programme following myocardial infarction, in which the intensity of professional support is determined not only by clinical risk but also by functional capacity, psychological profile, digital readiness, family support, and the availability of a specialist [1]. The results of the current empirical study support the validity of this differentiated approach: the predominance of health-related limitations, the low consistency between knowledge and reported behaviour, and the association between a doctor's recommendation and goal-oriented physical activity indicate that a recommendation with uniform content fails to take into account the significant heterogeneity of patients' needs.

An important limitation is the self-reported nature of the assessment of physical activity. The measures used in our study were influenced by patients' perceptions of their activity, recall, interpretation of the term "exercise", and the possibility of socially desirable responses. I. Kronish and colleagues objectively assessed activity using accelerometers in 330 patients following acute coronary syndrome; by the fifth week after discharge, only 16% were engaging in at least 30 minutes of moderate- or high-intensity physical activity approximately five days a week. The authors noted that accelerometer measurements were lower than the figures previously obtained from self-reports. Their early post-hospitalisation cohort is not directly comparable with our sample in the long-term follow-up period, but the study demonstrates the

risk of overestimating activity levels based on questionnaires. In future studies, it would be advisable to combine questionnaire-assessed physical activity with pedometers or accelerometers [12].

Despite methodological limitations, the identification of low purposeful physical activity has potential clinical significance. In a Swedish national cohort study by A. Lönn and colleagues, involving 47,153 patients following myocardial infarction, maintaining physical activity, increasing it, or even changing the level of activity during the first year was associated with a lower risk of recurrent non-fatal cardiovascular events compared with sustained inactivity. The lowest risk was observed in patients who remained active. Our cross-sectional study did not assess subsequent cardiovascular events and does not provide a basis for predicting them; however, the significant proportion of patients without targeted 30-minute activity identifies a clinically important group for further monitoring and the planning of rehabilitation interventions [14].

The practical implications of these findings go beyond a one-off information session. A meta-analysis by W. Shi and colleagues, comprising 73 studies with 24,985 participants, showed that structured education on secondary prevention improved knowledge and the likelihood of physical activity both in the short term and over a 6–12-month period; programmes lasting at least three months had a better long-term effect on awareness and physical activity. At the same time, the significant heterogeneity of the included studies suggests that the outcome depends on the content, duration, and delivery method of the programme. Our data are consistent with a model in which a doctor's recommendation should be the starting point, rather than the end point, of a behavioural intervention: this should be followed by checking that the recommendations have been understood, jointly setting goals, teaching self-monitoring, providing repeated feedback, and supporting adherence [20].

Home-based and remote formats may offer a practical solution for patients who do not have access to centre-based programmes. A systematic review and meta-analysis by H. Ramachandran and colleagues showed that home-based telerehabilitation, compared with standard care, was associated with improvements in functional ability, physical activity, and depressive symptoms, and, compared with centre-based rehabilitation, showed broadly comparable outcomes in terms of functional ability, behaviour, quality of life, and some clinical outcomes. At the same time, such programmes must include monitoring of compliance and objective assessment of activity, rather than merely the remote transmission of information [19].

More recent data strengthen the case for accessible home-based formats, whilst also highlighting the need for more objective monitoring of compliance with prescribed exercises. A systematic review and meta-analysis by L. Li and colleagues, comprising 13 randomised controlled trials (1,508 participants), showed that home-based cardiac rehabilitation using mobile technologies, compared with standard care, improved the six-minute walk distance and peak oxygen consumption, whilst no significant differences were found compared with centre-based rehabilitation; the authors, however, rated the certainty of the evidence as low or very low [13]. A review by M. Jarallah and co-authors on methods for monitoring home-based programmes showed that in studies, adherence is often assessed narrowly and via self-report, whilst intensity is most frequently measured objectively using wearable devices; the quality of performance, progression, and regression in exercises are scarcely monitored [8]. This is fundamental to the interpretation of our results: a positive response regarding 30-minute activity reflects a behavioural marker, but does not indicate full compliance with the individualised exercise prescription.

A qualitative systematic review by K. Platz and co-authors of alternative models of cardiac rehabilitation across 25 studies involving 487 participants showed that patients responded positively to home-based and adapted exercise options, including walking, chair exercises, aquatic exercises, yoga, digital-based training, and personalised plans. The decision to start or continue an activity depended on perceived benefits, physical limitations, safety, accessibility, and support. These findings are consistent with our categorisation of barriers and suggest that an optimal programme should not offer a single standard format, but rather a range of adapted options tailored to the patient's functional status and living conditions [18].

Limitations of the study. The strengths include a stratified random sample drawn from a source population of 912 patients, a standardised interview procedure, and the distinction made between spontaneous awareness, self-reported behaviour, daily walking, and purposeful physical activity. The main limitations are the cross-sectional design, self-reported measures of physical activity, the lack of precise assessment of activity intensity and weekly volume, and limited coverage of systemic barriers.

It is not possible to establish the direction of causality in the associations: more active patients may have been better at remembering recommendations or discussed exercise more frequently with their doctor. The measure of spontaneous awareness is not a validated health literacy scale, and the term “willpower” does not allow for the distinction between self-efficacy, motivation, anxiety, and depressive symptoms. Structural gaps regarding goal-directed activity were concentrated amongst clinically more complex patients. Residual confounding is possible due to unmeasured functional, psychological, and systemic factors; the regional context limits the external validity of absolute estimates.

Consequently, the results suggest that following myocardial infarction, there is not just one but several interrelated gaps: between everyday walking and specifically organised exercise, between spontaneous awareness and stated commitment, and between receiving a recommendation and putting it into practice. The doctor's recommendation was most strongly associated with physical activity, but the recommendation itself did not remove functional and behavioural barriers. This justifies a shift from one-off advice to a long-term personalised programme that combines functional assessment, safe exercise prescription, training, confidence-building, monitoring, and accessible home support.

## 5. Conclusions

In patients during long-term follow-up following myocardial infarction, everyday walking, spontaneous awareness of the preventive role of physical activity, self-reported use of physical activity as a preventive measure, and engagement in approximately 30 minutes of continuous purposeful activity reflected different aspects of behaviour and were not interchangeable. Although 72.1% of participants reported walking for ≥30 minutes per day, approximately 30 minutes of continuous purposeful activity was performed by 31.1% of those assessed; these figures do not allow for a determination of compliance with current physical activity guidelines without data on intensity and weekly volume.

The agreement between spontaneous awareness and reported engagement in physical activity as a preventive measure was low ($\kappa = 0.237$; positive agreement 33.3%). A doctor's recommendation regarding exercise was associated with an almost twofold higher prevalence of purposeful physical activity (aPR = 1.97; 95% CI 1.27–3.05), whilst diabetes mellitus was associated with a lower prevalence (aPR = 0.46; 95% CI 0.23–0.96).

The main self-reported barriers were health-related limitations (45.6%) and “lack of willpower” (32.1%). The findings support a shift from one-off advice to a personalised programme involving functional assessment, individually tailored exercise regimens, training, and regular follow-up.

## Prospects for further research

The next step would be to conduct a prospective empirical evaluation of the previously proposed differentiated home-based physical therapy programme following myocardial infarction [1]. Taking into account the results of the current study, such a trial should involve stratifying patients according to functional and behavioural barriers and assessing physical activity using objective or validated methods, adherence to the prescribed programme, functional capacity, self-efficacy, psychological factors, safety, and long-term maintenance of behavioural changes.

## Conflicts of interests

The authors hereby declare that there is no conflict of interest relating to the preparation and publication of this article.

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