

Role of physical activity in the development of resilience and adaptation in ageing: a narrative literature review

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Abstract

The aim of this study is to review the literature and synthesize the latest research (2023-2026) on the role of physical activity in enhancing resilience and supporting adaptation of older adults to the ageing process. Searches were conducted in the PubMed, Scopus, Web of Science, PsycINFO, and SPORTDiscus databases. Publications concerning gerontology, public health, and physical activity sciences covering a population aged 60 years or older were analyzed. Individual forms of physical activity and group programs combining various types of exercise were included. Their associations with resilience, psychological well-being, functional adaptation, social integration, and quality of life were assessed, taking into account potential psychological and social mechanisms. The included publications indicate that regular physical activity increases resilience, mental health, and functional independence. The most consistent results concern a reduced risk of frailty syndrome and functional disability. Resilience may act as a mediating mechanism between physical activity and psychological well-being, while social factors may enhance adaptive effects. The results suggest a multidimensional impact of physical activity on the ageing process, but further longitudinal studies are necessary to precisely define the causal mechanisms. Physical activity can be an important element of strategies supporting healthy ageing and maintaining autonomy in older adults.

Keywords: healthy ageing, functional independence, resilience, physical activity, exercise

Introduction

Population ageing is one of the most important challenges facing contemporary public health and social policy. The number of elderly people is rapidly increasing, requiring a redefinition of the approach to health, functional capacity, and quality of life in late adulthood. Healthy ageing should be understood as the process of maintaining functional capacity that enables well-being in old age, not merely the absence of disease [1]. Contemporary models of ageing emphasize its multidimensional nature, encompassing biological, psychological, and social aspects [2-4].

The ageing process is associated with numerous health and functional changes (declining physical capacity, increased risk of chronic diseases, limitations in independent functioning). Older adults experience social changes, including retirement, reduced social networks, and an increased risk of loneliness and social isolation [5-7]. Adaptation to these changes is a key factor determining older adults' quality of life and their ability to maintain autonomy in late adulthood.

In this context, the concept of mental resilience is attracting increasing research attention. Resilience is understood as an individual's ability to effectively adapt to difficulties, stressors, and life changes, as well as to maintain relative mental balance despite deterioration in health or functioning [8]. In the literature on ageing, resilience is conceptualized as a multidimensional and dynamic adaptive process that allows for maintaining relative psychological, functional, and social balance despite the adversities characteristic of late adulthood. Contemporary approaches emphasize that resilience is not solely a stable trait of an individual but rather results from the interaction between individual resources, environmental factors, and the ability to effectively respond to the stressors associated with ageing. In gerontological research, resilience is most often referred to as the ability to adapt to chronic illnesses, functional limitations, social losses, and psychological changes occurring in late adulthood. This approach is consistent with the biopsychosocial model of ageing, which assumes the interplay of biological, psychological, and social factors in shaping the health and quality of life of older people [3].

It should be noted that resilience in ageing research is conceptualized and operationalized in a heterogeneous manner. Depending on the theoretical framework, resilience may be understood as a relatively stable psychological trait, a dynamic adaptive process, or an outcome reflecting successful adjustment to adversities in later life. In empirical studies involving older adults, resilience is most often assessed using standardized psychometric scales that capture psychological resilience, adaptive capacity, coping resources, perceived control, and psychological well-being. This variability in conceptualization and measurement may contribute to heterogeneity across studies and may limit direct comparisons between findings. Nevertheless, current evidence suggests that higher resilience is consistently related to more favorable indicators of successful ageing, psychosocial functioning, and adaptation to health-related and social changes in later life [8]. Gerontological research indicates that a high level of resilience promotes better coping with chronic diseases, functional limitations, and social losses characteristic of late adulthood [9,10]. Resilience is becoming a significant adaptive resource, enabling the maintenance of psychological well-being despite the progressive changes associated with ageing.

Physical activity is one of the most important modifiable determinants of healthy ageing, affecting both somatic and mental functioning [5,8,10]. Regular physical activity is associated with improved body performance, reduced risk of chronic diseases, and delayed development of frailty [5,6]. At the same time, it influences neurobiological mechanisms related to neuroplasticity, neurotransmitter regulation, and stress response, which translates into improved

mood, cognitive functions, and psychological well-being [11-13]. Meta-analyses confirm a significant association between physical activity levels and lower levels of depressive and anxiety symptoms in older adults [11,14-17].

From a psychological perspective, physical activity may enhance a sense of agency, self-esteem, and self-efficacy – components closely related to resilience. The included publications indicate that older adults who engage in regular physical activity demonstrate higher levels of resilience and better adaptation to health and functional changes [8,18]. Furthermore, group-based physical activity promotes building social relationships, reducing loneliness and supporting social adaptation [10,19]. Multi-component exercise programs improve mobility, balance, and the ability to perform daily activities, which helps maintain functional independence and a sense of autonomy [20,21].

Despite the growing body of research, many studies focus on single aspects, physiological or psychological, rarely integrating the health, functional, and social dimensions of adaptation in ageing. There is a lack of comprehensive empirical approaches examining physical activity as a factor supporting resilience from a biopsychosocial perspective.

Aim of the work

The aim of this article is to provide a narrative review of the literature on the role of physical activity in shaping resilience and supporting health, as well as functional and social adaptation, in older people. Understanding these relationships is crucial for both designing health promotion programs and developing interventions that support the health and active ageing of the population.

Research question

The aim of the study was further refined by formulating a research question based on the PICO model:

Does physical activity promote resilience and support the adaptation of older adults to the health-related, social, and functional changes associated with ageing?

Population (P): People aged ≥ 60 years, healthy, with chronic diseases, participating in physical activity studies.

Intervention (I): Physical activity: various forms (structured exercise programs, multi-component training, aerobic, strength, and balance exercises, as well as regular physical activity in daily life).

Comparison (C): People with low levels of physical activity or not participating in exercise interventions, including control groups.

Outcome (O): The impact of physical activity on indicators of adaptation in ageing, including:

- resilience,
- mental health (severity of depressive and anxiety symptoms and psychological well-being),
- functional adaptation (mobility, balance, performance in daily activities),
- social adaptation (social support, social integration),
- quality of life.

Methods

The literature review was conducted based on scientific publications from the period 2023-2026, available in the PubMed, Scopus, Web of Science, PsycINFO, and SPORTDiscus databases. The search strategy included combinations of keywords related to physical activity, resilience, adaptation, and the ageing process, using Boolean operators (AND and OR). The search terms used were “physical activity”, “exercise”, “resilience”, “adaptation”, “healthy ageing”, “elderly”, and “functional independence”. Publications involving individuals aged ≥ 60 years that assessed the impact of physical activity or structured exercise programs on indicators of adaptation during ageing were included in the analysis.

Various forms of physical activity were considered, including multi-component exercise programs, aerobic training, strength training, and balance exercises. The reviewed studies also considered potential mediating mechanisms, including psychological and social factors such as self-efficacy, emotion regulation, and social integration. Outcomes assessed included measures of psychological resilience, mental health (including the severity of depressive and anxiety symptoms and psychological well-being), functional adaptation (including mobility, balance, and performance in activities of daily living), social adaptation (including social support and social integration), and quality of life. Some studies also included comparison groups of individuals with low levels of physical activity or who did not participate in exercise interventions.

The review excluded publications covering populations younger than 60 years of age, non-scientific publications, and studies reporting solely biological outcomes without reference to psychological or social functioning. Due to the diversity of intervention types and measurement methods, a narrative synthesis of the results was used, which enabled the identification of the main mechanisms through which physical activity influences healthy ageing.

The literature selection process was inspired by the PRISMA 2020 guidelines (Figure 1).

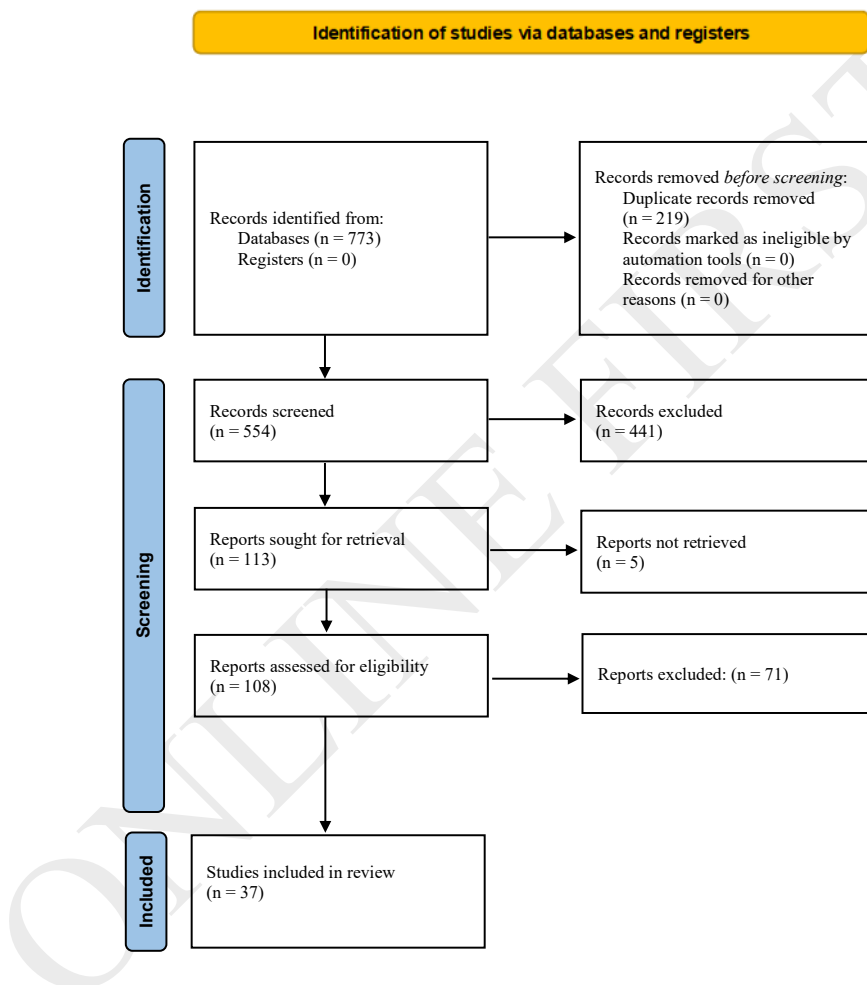


Figure 1. Simplified publication flow diagram inspired by the PRISMA 2020 guidelines

Notes: The diagram shows the process of identification, selection, full-text assessment, and inclusion of studies in the narrative synthesis.

Literature review results

Physical activity and mental resilience of older people

Analysis of the included publications demonstrates a consistent positive association between physical activity levels and indicators of psychological resilience in older adults. Several cross-sectional studies reported that older adults engaging in regular physical activity achieved significantly higher scores on measures of adaptability and resilience compared with sedentary individuals [8,10]. Studies using mediation models showed that the relationship between physical activity and resilience may be partially explained by increased self-efficacy and social support. Such mechanisms were described as contributing to reduced loneliness and enhanced psychological well-being among older adults participating in regular exercise programs [10].

Intervention studies also provide evidence supporting the beneficial role of physical activity in strengthening resilience. Programs involving aerobic exercise, strength training, and multicomponent functional training were associated with significant improvements in resilience measured using standardized psychometric instruments [8,9]. These effects were observed both in generally healthy older populations and among individuals with chronic diseases, suggesting that the psychological benefits of physical activity are not limited to healthy individuals.

In the context of adaptation to health-related changes, several studies reported that older adults undertaking regular physical activity experienced a greater sense of control over their health and greater confidence in coping with functional limitations, which is consistent with the concept of resilience as an adaptive resource [5,6]. The included publications also suggest that physical activity may contribute to delaying the progression of functional decline, indirectly supporting quality of life and psychological well-being in later life [5].

Differences were additionally observed depending on the social context in which physical activity was performed. Group-based programs were more frequently associated with higher resilience scores than individually performed exercise, highlighting the potential importance of social interaction and belonging in strengthening adaptive resources [9]. This effect may be related to increased social support and stronger feelings of social connectedness among physically active older adults.

At the same time, it should be emphasized that a considerable proportion of the available studies were cross-sectional or quasi-experimental in design, limiting the possibility of drawing causal conclusions. Nevertheless, the consistency of findings across observational and

intervention studies supports a relatively stable relationship between higher physical activity levels and greater psychological resilience in older adults. Overall, current evidence suggests that physical activity may represent an important factor supporting adaptive resources and psychological well-being in the face of health, social, and functional changes associated with the ageing process.

Physical activity and adaptation to health changes

In the context of adapting to health changes, physical activity is significantly associated with improved overall health and reduced risk of progression of chronic diseases typical of old age. Regular physical activity is associated with maintaining functional fitness, reducing the risk of falls, and delaying the progression of limitations associated with ageing. Observational and experimental studies indicate that higher levels of physical activity are associated with a lower risk of frailty, which is a key predictor of health and functional decline in the elderly population [22,23].

Epidemiological studies also show that increased physical activity is associated with a lower risk of multimorbidity and cardiovascular, metabolic, and musculoskeletal diseases [5]. Moderate- and high-intensity activity is particularly important. Literature also indicates a positive relationship between physical activity levels and subjective health assessments and quality of life in ageing individuals [24,25]. Studies examining the relationships between physical activity, functional fitness, and quality of life show that higher levels of exercise correlate with better physical functioning and greater independence in daily activities, which is an important element of adaptation to age-related health changes [24].

The importance of physical activity in the prevention of chronic diseases is also emphasized by public health reports. Data from the World Health Organization indicate that regular physical activity reduces the risk of non-communicable diseases, such as cardiovascular disease and type 2 diabetes, and also promotes improved overall physical and mental fitness in older adults, which translates into greater adaptability to health burdens [26]. Studies considering biopsychosocial indicators suggest that physical activity may act as a protective factor against the negative consequences of chronic diseases through both biological and psychosocial mechanisms, such as an increased sense of agency and motivation to maintain independence [5,22,24,27].

Physical activity and social adaptation

Analysis of the included publications indicates that physical activity plays a significant role in the social adaptation process of older adults. Most observational studies have shown that higher levels of physical activity are associated with lower loneliness and a greater sense of social belonging [9,10]. This association remained significant after adjustment for covariates such as age, gender, and health status. In modeling studies, resilience and social support acted as mediators between physical activity and loneliness. This indicates that physical activity does not only directly affect psychological well-being but also, by strengthening psychosocial resources, promotes better social adaptation [10]. In particular, forms of activity conducted in groups, such as multi-component training or recreational activities, were associated with higher rates of social integration and a positive ageing identity [9]. Additionally, qualitative and review studies indicate that older adults perceive physical activity as a space for building relationships and maintaining social roles, which can foster a sense of meaning and belonging [28]. From an adaptive perspective, this means that physical activity can counteract the negative effects of retirement, the loss of a partner, or limited social contacts. Physical activity, especially in a group setting, appears to promote social adaptation by strengthening social support, reducing loneliness, and building a positive ageing identity.

Physical activity and functional adaptation and autonomy

In the context of functional adaptation, accumulated empirical evidence indicates that regular physical activity is associated with maintaining fitness, mobility, and independence in performing activities of daily living [5]. Multicomponent exercise programs, incorporating elements of strength training, balance, and endurance, led to improved physical functioning and a reduced risk of frailty progression [6]. From a psychological perspective, maintaining physical fitness was associated with a higher sense of control and agency, which are important components of resilience.

In intervention studies, improved functional parameters correlated with improved psychological well-being, suggesting a relationship between physical and psychological adaptation [8]. It is worth emphasizing that physical activity can have a dual impact: directly by improving physiological parameters and indirectly by increasing the sense of autonomy. Maintaining independence in ADLs and IADLs reduces dependence on caregivers and may reduce the stress associated with progressive ageing. At the same time, it should be noted that

some studies indicated varying effectiveness of interventions depending on baseline fitness level and the presence of chronic diseases [20,28]. The strongest effects were observed in prefrail individuals, which may suggest greater preventive than therapeutic potential for physical activity in relation to functional frailty. Physical activity promotes functional adaptation by maintaining mobility, reducing the risk of disability, and strengthening the sense of autonomy, which is a significant element of older adults' adaptive resources [20-24].

Factors moderating the effect of physical activity on adaptation in ageing

The impact of physical activity on the adaptation of older adults is not uniform and can be modified by a number of psychological, social, and demographic factors. Literature emphasizes that the effects of physical activity depend not only on the level of activity itself but also on the psychosocial context and individual resources. One of the most frequently cited moderators is social support. Research suggests that older adults living in an environment conducive to physical activity, including support from family, friends, or the local community, are more likely to maintain regular activity and achieve better adaptation outcomes. Included publications indicate that higher levels of social support are associated with greater physical activity and better mental health in the older population [29].

Psychological factors, such as self-efficacy, emotional regulation, and a positive perception of the ageing process, may also play a significant role. Studies examining the relationship between physical activity and psychological well-being indicate that resilience often serves as a mediator between physical activity and psychological well-being [29,30]. At the same time, the strength of this relationship may vary depending on demographic factors. One study demonstrated that gender moderates the relationship between physical activity and resilience (the effect of physical activity on resilience was stronger in women than in men) [30].

Another important moderating factor is the social context and the form of physical activity undertaken. Research indicates that activity undertaken in a social environment, for example, as part of group activities or community programs, may promote stronger adaptive outcomes than individual activity. This mechanism is explained by the ability to develop social relationships, increase the sense of belonging, and strengthen a positive ageing identity [9].

Literature emphasizes the importance of psychosocial resources, such as family support, a sense of meaning in life, and social engagement. These factors may enhance the positive effects of physical activity by reducing stress, improving psychological well-being, and increasing motivation to maintain an active lifestyle. Research indicates that higher levels of

social support are associated with higher resilience and lower levels of anxiety symptoms in older adults [29].

Demographic and health factors (age, gender, education level, health status) are also worth considering. These differences may influence the level of physical activity undertaken and adaptive outcomes (older adults with greater educational or social resources are more likely to participate in organized forms of activity and demonstrate higher levels of psychosocial adaptation) [9].

Therefore, available research indicates that the impact of physical activity on adaptation in ageing is a multidimensional process and dependent on numerous moderating factors. The most important of these include social support, an individual's psychological resources, the type of activity undertaken, and demographic conditions. Taking these factors into account when designing physical activity programs for older adults may increase the effectiveness of interventions and promote better health, mental, and social adaptation in the ageing process.

Consistency and quality of available scientific evidence

Given the narrative nature of this review, the assessment of evidence quality was descriptive rather than based on formal risk-of-bias tools. Analysis of the included studies indicates a relatively high consistency of results regarding the relationship between physical activity and various aspects of adaptation in ageing. Observational and interventional studies suggest that higher levels of physical activity are associated with better mental health, higher levels of resilience, and improved functional capacity in older adults. The results of many analyses also indicate that physical activity may promote independence and improve quality of life in the elderly population [31].

It is worth emphasizing that the quality of the available evidence is varied. A significant portion of studies examining the relationship between physical activity and resilience are cross-sectional, which limits the ability to draw causal conclusions. Cross-sectional studies primarily allow for the identification of correlations between physical activity levels and indicators of mental health or social functioning but do not allow for a clear determination of the direction of these relationships [32]. Longitudinal studies and randomized controlled trials (RCTs) have a higher evidentiary value, allowing for the assessment of the impact of exercise interventions on various aspects of functioning in older adults. Data from systematic reviews and meta-analyses indicate that exercise-based interventions can provide significant cognitive benefits in older adults. Training programs that include aerobic activity, strength training, or multi-

component exercises are associated with improved cognitive function, particularly memory, attention, and executive function [11,12,33-35].

Analyses also indicate that the effect size depends on training program parameters, such as intensity, frequency, and duration of the intervention, suggesting a dose-response relationship between physical activity and cognitive functioning. Furthermore, studies highlight that multi-component interventions combining various forms of physical activity may be particularly beneficial in maintaining cognitive performance in older adults [33-35].

Intervention heterogeneity is also an important element in assessing the quality of evidence. Studies examined various forms of physical activity (aerobic training, strength training, multi-component programs, recreational activity). This diversity hinders direct comparison of study results but also indicates that beneficial effects can be achieved using different forms of physical activity [25].

Interpretation of the results of studies on resilience in ageing is hampered by the significant variation in measurement tools used in individual analyses. The included publications utilize various psychometric scales and questionnaires assessing psychosocial functioning and psychological well-being, which limits the possibility of direct comparisons between studies and complicates the synthesis of data in literature reviews. Despite this methodological heterogeneity, most analyses indicate that resilience is an important psychological resource that promotes psychological well-being and supports the process of successful ageing. Systematic reviews suggest that higher levels of resilience are associated with better psychosocial functioning, greater adaptation to health changes, and higher quality of life in older adults [27].

Despite these limitations, the overall picture of research findings remains relatively consistent. Most analyses indicate that physical activity is associated with better physical, mental, and social functioning in older adults. Therefore, the available scientific evidence points to a significant role of physical activity in the adaptation process during ageing. Although some studies are observational and do not allow for clear causal inferences, the consistency of results across different populations and using different research methods suggests that physical activity may be an important factor supporting healthy ageing and maintaining psychological and functional well-being in older adults.

Practical implications

Accumulating evidence suggests that physical activity should be viewed not only as a preventative measure for somatic diseases but also as a tool for strengthening the adaptive resources of older adults. Multi-component programs encompassing strength training, balance exercises, and endurance exercise are particularly effective in maintaining functional fitness and reducing the risk of frailty. Research indicates that such interventions can improve mobility, balance, and the ability to perform daily activities, supporting older adults' adaptation to health changes associated with ageing [25].

A key factor in increasing the effectiveness of physical activity programs is incorporating their social dimension. Group-based activity fosters the development of social relationships, increases a sense of belonging, and reduces loneliness among older adults. The included publications indicate that group programs can enhance the positive impact of physical activity on the psychological well-being and social functioning of older adults [19,36,37].

Literature emphasizes the need to adapt physical activity programs to the functional fitness level and health status of older adults. Research indicates that even moderate levels of physical activity can contribute to improved quality of life and reduced the risk of functional decline, supporting the individualization and gradual increase in exercise intensity [25].

The importance of physical activity in healthy ageing is also emphasized by public health recommendations and research on exercise interventions for older adults. Incorporating physical activity recommendations into preventive measures implemented in primary health care may improve the physical and mental health of older adults and reduce the risk of functional disability. Integrating physical activity programs with the healthcare system and social initiatives may be an important element of strategies supporting healthy and active ageing of the population [25].

Discussion of the review results

Population ageing is one of the key challenges of contemporary public health. According to international reports, healthy ageing encompasses not only lifespan extension but, above all, the maintenance of functional capacity, psychological well-being, and social activity in late adulthood [1,3]. Contemporary models of ageing emphasize the importance of a biopsychosocial approach, in which physical, mental, and social health are closely intertwined [4,5].

The findings of this review suggest that physical activity may play an important role in shaping resilience and supporting older adults' adaptation to health, functional, and social changes associated with ageing. One of the main conclusions emerging from the reviewed literature concerns the relationship between physical activity and mental functioning in older adults. The included publications indicate that regular physical activity may reduce depressive and anxiety symptoms, improve mood, and enhance overall psychological well-being [9,14,16]. The mechanisms underlying these relationships include both neurobiological processes, such as increased brain neuroplasticity and neurotransmitter regulation, and psychosocial factors, including increased self-efficacy and social integration [11,17].

Another important area concerns the role of physical activity in maintaining cognitive function in older age. Findings from meta-analyses indicate that exercise programs, particularly multicomponent interventions, may support cognitive function and may contribute to reducing the risk of mild cognitive impairment and dementia [12,33,35]. This relationship may be partially explained by the beneficial effects of physical activity on cerebral blood flow, neurogenesis, and neurotransmitter systems [11].

The reviewed literature also highlights the importance of physical activity for maintaining functional fitness and delaying frailty. Frailty is considered one of the major predictors of disability and loss of independence in old age [6]. Evidence from intervention studies and meta-analyses shows that regular physical activity, especially in the form of multicomponent programs, may improve mobility, balance, and muscle strength, thereby reducing the risk of functional disability [20,21]. These findings suggest that physical activity may constitute an important element of strategies aimed at delaying functional decline and extending one's lifespan [5].

In the context of social adaptation, the role of physical activity in building social relationships and reducing loneliness is particularly important. Social relationships are a significant determinant of health in ageing populations [7]. The included publications indicate that group-based physical activity may promote social support, reduce loneliness, and support social adaptation in older adults [10,19,37]. These mechanisms may also mediate the relationship between physical activity and psychological resilience, as suggested by mediation analyses in selected studies [29,30].

The findings of this review also point to the role of physical activity in shaping positive ageing identity and strengthening adaptive capacity in older adults. Physical activity may influence psychological processes related to agency, self-esteem, and resilience, which in turn may support better adaptation to age-related changes [8,9]. In this context, physical activity can

be viewed as a resource that strengthens an individual's ability to cope with the health and social challenges typical of late adulthood.

Overall, the reviewed literature suggests that the impact of physical activity on adaptation in the ageing process is multidimensional and involves biological, psychological, and social mechanisms (Table 1).

Table 1. Mechanisms through which physical activity supports adaptation in the ageing process

Level of mechanism	Mechanism of action	Main effects observed in studies	Example sources
Biological	Improvement of cardiovascular and metabolic functioning	Reduced risk of chronic diseases and improved overall physical capacity	[5,20]
Biological	Enhancement of neuroplasticity and brain function	Improved cognitive performance and delayed neurodegenerative processes	[11,12,33]
Biological	Strengthening of the musculoskeletal system	Improved mobility, balance, and ability to perform activities of daily living	[21,23]
Psychological	Reduction of depressive and anxiety symptoms	Improved mental health and psychological well-being	[14,16,31]
Psychological	Increased self-efficacy and self-esteem	Greater psychological resilience and better coping with age-related stressors	[8,18]
Psychological	Enhancement of subjective well-being	Higher life satisfaction and better psychological adaptation to ageing	[25,31]
Social	Development of social relationships and support networks	Reduced loneliness and social isolation	[7,37]
Social	Participation in group-based physical activity programs	Increased social integration and sense of belonging	[10,19]
Social	Strengthening of positive ageing identity and social adaptation	Better adaptation to social changes in later life	[9,29]

At the same time, certain limitations of the available studies should be emphasized. Some of the analyzed studies were cross-sectional in nature, which limits the possibility of drawing causal inferences. Furthermore, literature demonstrates significant heterogeneity between exercise interventions, measurement instruments, and study populations, making direct comparisons of results difficult. Diversification of methods for measuring resilience, psychological well-being, and quality of life may influence the interpretation of intervention effects [27]. This indicates the need for further longitudinal studies and RCTs of high methodological quality. Despite numerous studies on the role of physical activity in the ageing

process, literature indicates significant research gaps requiring further exploration. The most important areas requiring in-depth research are presented in Table 2.

Table 2. Research gaps and future directions in studies on the effects of physical activity on adaptation in ageing

Research area	Identified gaps in the literature	Recommended directions for future research	Example sources indicating the need for further research
Psychological resilience	Limited number of longitudinal studies examining the relationship between physical activity and resilience in later life	Prospective studies investigating how different types and intensities of physical activity influence the development of resilience in older adults	[8,27]
Psychological mechanisms	Insufficient understanding of mediating mechanisms such as self-efficacy, emotion regulation, and coping strategies	Studies using mediation models and structural equation modelling to examine psychological pathways linking physical activity and adaptation	[10,30]
Cognitive functioning	Heterogeneity of findings regarding the effects of different exercise modalities on cognitive outcomes	RCTs comparing aerobic, resistance, and multicomponent exercise interventions	[11,33,35]
Social adaptation	Limited research examining how physical activity influences social integration, social participation, and support networks in older adults	Intervention studies focusing on group-based physical activity programs and community-based initiatives	[19,37]
Frailty and functional decline	Limited evidence regarding the optimal dose, intensity, and frequency of physical activity for preventing frailty	Longitudinal and intervention studies examining dose-response relationships between physical activity and frailty risk	[6,23]
Multicomponent interventions	Lack of long-term studies evaluating interventions combining physical, cognitive, and social components	Interdisciplinary studies assessing the effectiveness of multidomain interventions in promoting healthy ageing	[20,21]
Public health perspective	Limited implementation research on strategies for promoting physical activity among older adults at the population level	Implementation studies and policy-oriented research evaluating community-based programs and health system interventions	[1,2]

Conclusions

The results of this literature review indicate that physical activity is an important factor supporting healthy ageing and the adaptation of older adults to health, functional, and social changes. Regular physical activity is associated with better mental health, cognitive functioning, and functional capacity, as well as higher levels of resilience and psychological well-being.

Accumulating evidence suggests that physical activity may support social adaptation in older adults by increasing social support, reducing loneliness, and strengthening interpersonal relationships. In the context of ageing societies, physical activity may be viewed as one of the key modifiable factors supporting the maintenance of autonomy and quality of life in older adults.

Based on the reviewed literature, available evidence supports the inclusion of physical activity in strategies promoting healthy ageing. The implementation of exercise programs in community and healthcare settings may contribute to improving the physical and mental health of older adults. Multicomponent interventions, including strength training, balance exercises, and aerobic activity, as well as group programs that foster social relationships and interpersonal support, appear to provide favorable outcomes.

Future research should focus on identifying optimal parameters for exercise interventions, such as intensity, frequency, and duration, as well as analyzing the psychological and social mechanisms mediating the relationship between physical activity and adaptation during ageing.

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