

Prioritizing Strategies to Promote Physical Activity Among Older Adults With Functional Limitations: A Focus Group and Analytic Hierarchy Process Study

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Research Article

Keywords: physical activity, older adults with functional limitations, post-COVID-19, policy strategies, analytic hierarchy process

Posted Date: October 27th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-11021006/v1>

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Additional Declarations: No competing interests reported.

Abstract

Background

This study aimed to identify and prioritize strategies for promoting physical activity among older adults with functional limitations in the post-COVID-19 context. However, little evidence exists regarding which strategic options should be prioritized.

Methods

A mixed-method approach was employed, combining two-round focus group interviews (FGIs) with 20 experts in adapted physical activity and disability sports and a subsequent Analytic Hierarchy Process (AHP) survey. The FGIs were used to identify key strategic factors based on the socio-ecological model, and the AHP was applied to evaluate their relative priority through pairwise comparisons.

Results

Qualitative analysis identified five strategic domains and 17 sub-factors relevant to physical activity promotion. The AHP results indicated that the establishment of a legal and institutional basis for physical activity promotion received the highest global priority (0.285), followed by strengthening promotional efforts (0.177) and securing financial resources (0.123). In contrast, infrastructure-related sub-factors, including accessibility to existing sports facilities (0.026) and recruitment of new on-site sports instructors (0.003), received comparatively lower global priority weights.

Conclusions

Experts assigned the highest priority to policy-level and structural strategies, particularly legal, institutional, and policy support and financial support. The findings support a multi-level priority-setting approach in which policy, community, organizational, interpersonal, and individual strategies are considered together when designing inclusive physical activity systems for older adults with functional limitations in the post-pandemic context.

Background

The COVID-19 pandemic placed unprecedented pressures on global health systems and social structures, disproportionately affecting vulnerable populations, including older adults and people with disabilities (1, 2). Among these populations, older adults with functional limitations face particular challenges because of their greater vulnerability to infection, higher prevalence of chronic conditions, and persistent barriers to accessing health and social services (3). Public health measures implemented during the pandemic—including lockdowns, social distancing, and the closure of recreational and

community facilities—substantially restricted opportunities for physical activity. These restrictions raised concerns regarding health inequalities, physical decline, and social isolation among older adults with functional limitations (4, 5). Limited opportunities for physical activity are also relevant to the maintenance of muscle strength, mobility, and functional independence and to the prevention and management of falls and chronic conditions in later life (6, 7). In addition to these physical considerations, prolonged inactivity and reduced social interaction may have implications for psychological well-being and quality of life (8, 9).

These challenges highlight the importance of developing accessible and sustainable opportunities for physical activity among older adults with functional limitations, particularly in the context of post-pandemic recovery. Physical activity is widely recognized as an important component of healthy aging and disability management. Regular participation is associated with cardiovascular health, muscular strength, management of chronic conditions, psychological well-being, and social engagement (10, 11). Nevertheless, people with disabilities continue to encounter barriers to physical activity participation, including environmental inaccessibility, insufficient institutional support, and limited availability of appropriate programs (12, 13). During the COVID-19 pandemic, these challenges were further complicated by the suspension of community-based programs and the shift toward digital forms of participation, which were not necessarily accessible to all older adults with functional limitations (1, 2).

Although research on physical activity among people with disabilities has expanded, empirical evidence specifically addressing strategic priorities for promoting physical activity among older adults with functional limitations remains limited. Previous studies have largely examined barriers and facilitators to participation (13, 14). Less attention has been given to the question of which strategies should receive greater priority when policymakers and practitioners must consider multiple options within limited resources. In public health and policy settings, systematic priority-setting approaches can facilitate transparent resource allocation and structured consideration of alternative strategies. Without an explicit prioritization process, policy initiatives may place greater emphasis on readily visible programmatic activities while giving comparatively less consideration to institutional, organizational, and structural strategies.

To address this gap, the present study adopts the socio-ecological model of health promotion as a conceptual framework (15). The socio-ecological model organizes health-related factors across multiple levels, including intrapersonal, interpersonal, organizational, community, and policy environments. Applied to physical activity promotion among older adults with functional limitations, this framework provides a basis for considering individual, interpersonal, organizational, community, and policy dimensions within a common analytical structure (12). Importantly, in the present study, the socio-ecological model is used to classify strategic factors according to the primary level at which the corresponding strategy would be implemented. It is not used to test causal relationships among socio-ecological levels or to estimate causal effects.

This study therefore employs a mixed-method approach integrating focus group interviews (FGIs) and the Analytic Hierarchy Process (AHP). FGIs provide an opportunity to identify and refine strategic factors through in-depth discussion with experts in adapted physical activity and disability sports. The AHP subsequently provides a structured decision-making framework for assessing the relative priority of these factors through systematic pairwise comparisons (16). Combining qualitative exploration with quantitative priority assessment enables the study to identify a set of strategic factors and examine their relative priority within a multi-level socio-ecological framework.

This study contributes to the existing literature in three ways. First, it applies a socio-ecological framework to the prioritization of strategies for physical activity promotion among older adults with functional limitations in the post-COVID-19 context. Second, it integrates qualitative exploration with AHP-based decision analysis to provide a structured approach to identifying and prioritizing multiple strategic factors. Third, it provides empirical evidence that can inform consideration of policy, community, organizational, interpersonal, and individual strategies within an integrated framework for developing sustainable and inclusive physical activity systems.

Accordingly, the purpose of this study is to identify and prioritize strategies for promoting physical activity among older adults with functional limitations in the post-COVID-19 context. Specifically, the study addresses three research questions: (1) Which multi-level strategic factors are identified as relevant to promoting physical activity among older adults with functional limitations? (2) How are these strategic factors relatively prioritized across different socio-ecological levels? and (3) What implications can be derived from the observed prioritization pattern for the development of multi-level strategies within the socio-ecological framework? By identifying and prioritizing strategic factors, this study seeks to provide a structured empirical basis for developing sustainable and inclusive physical activity systems for older adults with functional limitations.

Materials and Methods

2.1 Research Design

This study used a sequential mixed-method design to identify and prioritize strategies for promoting physical activity among older adults with functional limitations. The study consisted of two main stages: (1) qualitative identification and refinement of strategic factors through FGIs and (2) quantitative assessment of the relative priority of the identified factors using the AHP. The study was conducted in South Korea, and both the FGIs and the subsequent AHP survey were administered remotely. The study was conceptually grounded in the socio-ecological model of health promotion (15), which provides a framework for considering factors at the individual, interpersonal, organizational, community, and policy levels.

In the first stage, a literature review was conducted to establish the conceptual foundation of the study and to identify preliminary factors relevant to physical activity promotion among older adults with

functional limitations. These preliminary factors were organized according to the five levels of the socio-ecological model. Two rounds of FGIs were then conducted with experts from academic and professional practice settings. The FGIs were used to review, refine, and expand the preliminary factors and to identify additional strategic considerations relevant to promoting physical activity (17). Based on the findings from the literature review and FGIs, the identified factors were consolidated and organized into a hierarchical structure.

In the second stage, the factors identified through the qualitative process were incorporated into an AHP decision-making model and evaluated through systematic pairwise comparisons. AHP is a structured decision-making method for determining the relative priority of multiple criteria and has been applied to policy prioritization and other complex decision-making contexts (16). In the present study, AHP was used to assess experts' relative judgments regarding the importance of the identified strategic factors; it was not used to estimate causal effects, determine intervention effectiveness, or establish a temporal sequence of implementation.

Accordingly, the study followed a sequential FGI-to-AHP process. The same expert panel participated in both stages, first contributing to the identification and refinement of strategic factors through the FGIs and subsequently evaluating the relative priority of the resulting factors through AHP. This design enabled qualitative expert perspectives to inform the construction of the AHP hierarchy before quantitative priority assessment.

Participation was voluntary, and written informed consent was obtained from all participants. The research procedures were conducted with reference to the ethical principles of the Declaration of Helsinki (18).

2.2 Participants

To ensure that the qualitative identification of strategic factors and the subsequent AHP assessment were informed by relevant professional expertise, participants were recruited from academic and professional practice settings related to physical activity among older adults with functional limitations. The expert panel comprised two groups: researchers specializing in adapted physical activity and practitioners working as sports instructors in disability sports or geriatric exercise programs.

A total of 20 experts participated in the study. The practitioner group comprised 10 sports instructors (8 males and 2 females) aged 30–44 years, with 5–20 years of professional experience in disability sports or adapted physical activity programs. The researcher group comprised 10 university professors (7 males and 3 females) aged 35–44 years, with 6–11 years of academic experience. Overall, the expert panel consisted of 15 males and 5 females. Detailed demographic characteristics are presented in Table 1.

Participants were eligible if they met the following inclusion criteria: (a) at least five years of professional experience in adapted physical activity, disability sports, or geriatric rehabilitation; (b) current involvement in research or professional practice related to physical activity among older adults with

functional limitations; and (c) for researchers, a publication record in peer-reviewed journals, or for practitioners, relevant certified instructor qualifications combined with field experience. These criteria were established to ensure that participants had sufficient domain-specific expertise to provide informed judgments during both the qualitative and quantitative stages of the study.

The same expert panel participated in the two FGI rounds and subsequently completed the AHP survey. Although the panel comprised 20 experts, the sample size was considered appropriate for an expert-based AHP study in which the relevance and experience of panel members are important considerations in the composition of the decision-making group (16, 19). The panel did not include policymakers or older adults with functional limitations. Consequently, the prioritization results represent the perspectives of academic and professional experts and should not be interpreted as representing the views of policymakers or older adults with functional limitations themselves.

Table 1
General characteristics of participants

Category	Gender	Age (Year)	Occupation	Career (Years)
Practitioner 1	Male	44	Sports instructor	20
Practitioner 2	Male	39	Sports instructor	15
Practitioner 3	Female	34	Sports instructor	6
Practitioner 4	Male	38	Sports instructor	13
Practitioner 5	Male	41	Sports instructor	17
Practitioner 6	Female	30	Sports instructor	5
Practitioner 7	Male	39	Sports instructor	14
Practitioner 8	Male	38	Sports instructor	12
Practitioner 9	Male	36	Sports instructor	13
Practitioner 10	Male	37	Sports instructor	13
Researcher 1	Male	40	Professor	10
Researcher 2	Female	35	Professor	6
Researcher 3	Male	41	Professor	11
Researcher 4	Male	37	Professor	6
Researcher 5	Female	36	Professor	6
Researcher 6	Male	39	Professor	7
Researcher 7	Male	41	Professor	10
Researcher 8	Female	39	Professor	6
Researcher 9	Male	42	Professor	9
Researcher 10	Male	44	Professor	11

2.3 Data Collection

Data were collected through FGIs conducted online using the Zoom platform. Two FGI sessions were held on March 11 and April 15, 2025, respectively, and each session lasted approximately 90–120 minutes. Before participation, all participants were informed of the objectives and procedures of the study, and written informed consent was obtained. The FGI interview protocol was developed with reference to the socio-ecological model to ensure that the discussions considered strategic factors relevant to physical activity promotion across multiple levels. Accordingly, the interview questions addressed individual, interpersonal, organizational and environmental, community, and policy

dimensions relevant to physical activity participation among older adults with functional limitations. The FGI guide followed commonly used focus group procedures and consisted of five components: opening, introductory, transition, key, and closing questions (20) (Table 2).

All interviews were audio-recorded with participants' consent and transcribed verbatim. To enhance the credibility and trustworthiness of the qualitative analysis, the researchers used peer review, expert consultation, and researcher reflexivity as complementary strategies (21). In addition, two researchers independently reviewed and coded the transcripts. Differences in coding and interpretation were discussed between the researchers and resolved through consensus.

The qualitative analysis focused on identifying and refining strategic factors relevant to promoting physical activity among older adults with functional limitations. The identified factors were reviewed and categorized according to the socio-ecological framework. For classification purposes, each strategic factor was assigned to the socio-ecological level corresponding to the primary locus at which the related strategy would be implemented. The resulting factors were then consolidated into the hierarchical structure used for the subsequent AHP analysis.

Following completion of the FGIs, the AHP survey was administered to the same panel of experts over a four-week period via email. Participants performed pairwise comparisons among the identified factors to assess their relative priority. The AHP questionnaire was structured according to the hierarchy developed from the qualitative findings, and participants evaluated the relative priority of factors within each level of the hierarchy.

The consistency of each pairwise-comparison matrix was assessed using the consistency ratio (CR). A CR value of 0.10 or lower was considered acceptable for inclusion in the subsequent AHP analysis. Responses exceeding this threshold were excluded from the final priority calculation. The resulting AHP weights therefore represent the relative priorities assigned by the participating experts rather than causal effects, intervention effectiveness, or empirically established determinants of physical activity participation.

Table 2
Focus group interview guide

Category	Items
Opening questions	• Research guidance and introduction to research participants • Introduction of research overview, affiliation, experience in relevant field, etc.
Introductory questions	• Questions regarding personal opinions on physical activity for older adults with functional limitations
Transition questions	• Awareness of the current status and environment of physical activity for older adults with functional limitations • Experience-based changes in related fields, related issues by era, and recent trends
Key questions	• Questions about positive factors of physical activity for older adults with functional limitations • Questions about factors that hinder physical activity for older adults with functional limitations • Questions about strategies to promote physical activity among older adults with functional limitations
Closing questions	• Additional opinions on ways to promote physical activity among older adults with functional limitations • Opinions for improvements related to the research topic

2.4 Data Analysis

Data analysis was conducted in two sequential stages: qualitative analysis of the FGI data and quantitative assessment of relative priorities using the AHP. First, the FGI data were analyzed using qualitative content analysis. The interview transcripts were segmented into meaningful units and systematically coded to identify concepts relevant to physical activity promotion among older adults with functional limitations. Similar codes were grouped into broader categories through iterative comparison and discussion among the researchers. The resulting categories were reviewed and consolidated into strategic factors. The strategic factors were subsequently classified according to the five socio-ecological levels: individual, interpersonal, organizational, community, and policy. For classification purposes, each strategic factor was assigned to the socio-ecological level corresponding to the primary locus at which the related strategy would be implemented. This classification rule was applied consistently when a strategic factor could conceptually relate to more than one socio-ecological level. The qualitative analysis and subsequent consolidation resulted in five strategic domains and 17 sub-factors.

Second, the identified strategic factors were structured into an AHP hierarchical model. The hierarchy consisted of three levels: the overall goal, five strategic domains, and 17 sub-factors. The five strategic domains were compared pairwise at the domain level, and the sub-factors were compared pairwise

within their respective strategic domains. This hierarchical structure reduced the number of comparisons required at each decision level while allowing the relative priority of all 17 sub-factors to be calculated.

Pairwise comparisons were conducted using Saaty's 9-point fundamental scale. Priority weights were calculated using Expert Choice 11 software (22), based on the principal eigenvector method described by Saaty. For the aggregation of individual expert judgments, the geometric mean method was used to obtain group comparison values. Local priority weights were calculated for the strategic domains and for the sub-factors within each domain, and global priority weights for the 17 sub-factors were obtained by synthesizing the weights across the hierarchy.

The consistency of each pairwise-comparison matrix was evaluated using the consistency ratio (CR). A CR value of 0.10 or lower was prespecified as the criterion for acceptable consistency. Of the 20 AHP responses collected, 18 responses (90.0%) satisfied this criterion and were included in the final analysis. Two responses were excluded because their pairwise-comparison matrices had CR values greater than 0.10. The resulting AHP weights represent the participating experts' relative priority judgments regarding the strategic factors.

Results

3.1 Identification of Strategic Factors Based on the Socio-Ecological Model

The analysis of the FGIs identified five strategic domains and 17 sub-factors relevant to promoting physical activity among older adults with functional limitations (Table 3). During qualitative analysis, interview transcripts were coded systematically and organized into thematic categories through iterative comparison and discussion among the researchers. The identified factors were then structured within the socio-ecological model (15). For the purposes of this study, the five domains were classified according to the primary locus at which the corresponding strategy would be implemented: policy, community, organizational, interpersonal, and individual levels.

3.1.1 Policy Level – Legal and institutional foundations

At the policy level, strengthening legal, institutional, and policy support was identified as a strategic domain relevant to physical activity promotion among older adults with functional limitations. Participants emphasized the value of supportive policy environments and stable governance structures. The identified sub-factors were the establishment of a legal and institutional basis for physical activity promotion, securing budget for physical activity promotion, and measures for policy connection, including mid- to long-term plans by sector. Participants also discussed fragmented policy coordination and insufficient legislative support as contextual challenges for sustaining existing initiatives. These findings indicate that policy and governance considerations formed an important part of the strategic framework identified by the experts.

3.1.2 Community Level – Inter-organizational Exchange Systems

At the community level, establishment of an exchange system was identified as a strategic domain related to collaborative governance. Participants highlighted cooperation among sports organizations, welfare institutions, and local governments, with emphasis on service coordination and resource sharing. The sub-factors were establishment of an inter-agency cooperation support system, establishment of dedicated organizations for each field for efficient support, and expansion of linkage activities between organizations in each field. These factors describe a community-level framework for coordination among organizations involved in disability sport and community health promotion.

3.1.3 Organizational Level – Infrastructure Development

At the organizational level, securing infrastructure was identified as a strategic domain related to access and implementation of physical activity initiatives. The sub-factors included Connection to existing sports facilities with attention to accessibility, securing sports facilities exclusively for older adults with functional limitations, retraining and strengthening the expertise of existing staff, establishing a cooperation system between non-disabled sports associations and disabled sports associations, and recruiting new on-site sports instructors. Collectively, these factors describe organizational resources and arrangements considered relevant to inclusive physical activity provision.

3.1.4 Interpersonal Level – Enhancing Participation Engagement

At the interpersonal level, enhancing physical activity engagement was identified as a strategic domain. Participants discussed social encouragement, promotional activities, participation-oriented competitions, and awareness of the benefits of physical activity. The three sub-factors were strengthening promotion of physical activities for older adults with functional limitations, expanding participation competitions, and improving awareness of physical activity. These factors reflect the social and communicative dimensions of participation engagement identified during the FGIs.

3.1.5 Individual Level – Development of Tailored Physical Activity Programs

At the individual level, development of physical activity programs was identified as a strategic domain for addressing heterogeneous needs among older adults with functional limitations. Participants emphasized customized physical activity programs according to disability type and functional capacity. They also discussed activating connections between existing physical activity programs and developing physical activity programs using virtual environments. Overall, the FGI findings produced a five-domain, 17-sub-factor framework spanning policy, community, organizational, interpersonal, and individual levels.

Table 3. Strategic factors identified through focus group interviews for promoting physical activity among older adults with functional limitations

Socio-ecological level	Strategic domain	Sub-factors
Policy	Strengthening Legal, Institutional, and Policy Support	Establishment of a legal and institutional basis for physical activity promotion
		Measures for policy connection (including mid- to long-term plans by sector)
		Securing budget to promote physical activity for older adults with functional limitations
Community	Establishment of an exchange system	Establishment of an inter-agency cooperation support system
		Establishment of dedicated organizations for each field for efficient support
		Expansion of linkage activities between organizations in each field
Organizational	Securing infrastructure	Connection to existing sports facilities with attention to accessibility with attention to accessibility
		Securing sports facilities exclusively for older adults with functional limitations
		Retraining and strengthening the expertise of existing staff
		Establishment of a cooperation system between non-disabled sports associations and disabled sports associations
		Recruitment of new on-site sports instructors
Interpersonal	Enhancing physical activity engagement	Strengthening promotion of physical activities for older adults with functional limitations
		Expansion of participation competitions
		Improving awareness of physical activity
Individual	Development of physical activity programs	Development of customized physical activity programs for each type of disability
		Activating connections between existing physical activity programs
		Development of physical activity programs using virtual environments

Note: Each strategic factor was assigned to the socio-ecological level corresponding to the primary locus at which the related strategy would be implemented.

3.2 Priorities for Strategies to Promote Physical Activity

3.2.1 Priority among Main Strategic Domains

Table 4 presents the relative priority of the five strategic domains derived from the FGI findings and evaluated using AHP. Strengthening Legal, Institutional, and Policy Support received the highest priority (0.439) followed by enhancing physical activity engagement (0.318) and establishment of an exchange system (0.154). Securing infrastructure (0.053) and development of physical activity programs (0.036) received comparatively lower priority weights. The consistency ratio for the main-domain comparison was 0.048, indicating acceptable consistency.

Table 4. Relative priorities and ranks of the five strategic domains for promoting physical activity among older adults with functional limitations

Category	Sub-factors	Priority	Rank
Strengthening Legal, Institutional, and Policy Support	Establishment of a legal and institutional basis for physical activity promotion	0.439	1
	Securing infrastructure	0.053	4
	Enhancing physical activity engagement	0.318	2
	Establishment of an exchange system	0.154	3
	Development of physical activity programs	0.036	5
Consistency Ratio = 0.048			

3.2.2 Priorities within Each Strategic Domain

The AHP analysis identified differences in the relative priority of sub-factors within each strategic domain (Table 5). At the policy level, Establishment of a legal and institutional basis for physical activity promotion received the highest within-domain priority (0.649), followed by securing budgetary support (0.279) and measures for policy connection, including mid- to long-term plans by sector (0.072). At the community level, establishment of dedicated organizations for each field for efficient support received the highest priority (0.582), followed by establishment of an inter-agency cooperation support system (0.309) and expansion of linkage activities between organizations in each field (0.109). At the organizational level, connection to existing sports facilities with attention to accessibility with attention to accessibility received the highest priority (0.483), followed by securing sports facilities exclusively for older adults with functional limitations (0.253), retraining and strengthening the expertise of existing staff (0.135), establishing a cooperation system between non-disabled sports associations and disabled sports associations (0.078), and recruiting new on-site sports instructors (0.051). At the interpersonal level, strengthening promotion of physical activities for older adults with functional limitations received the highest priority (0.558), followed by expansion of participation competitions (0.319) and improving awareness of physical activity (0.123). At the individual level, development of customized physical activity programs for each type of disability

received the highest priority (0.637), followed by development of physical activity programs using virtual environments (0.258) and activating connections between existing physical activity programs (0.105). All domain-specific CR values were below 0.10.

Table 5. Relative priorities and ranks of sub-factors within each strategic domain

Category	Sub-factors	Priority	Rank
Strengthening Legal, Institutional, and Policy Support	Establishment of a legal and institutional basis for physical activity promotion	0.649	1
	Securing budget to promote physical activity for older adults with functional limitations	0.279	2
	Measures for policy connection (including mid- to long-term plans by sector)	0.072	3
	Consistency ratio = 0.067		
Securing infrastructure	Connection to existing sports facilities with attention to accessibility with attention to accessibility (securing accessibility)	0.483	1
	Securing sports facilities exclusively for older adults with functional limitations	0.253	2
	Retraining and strengthening the expertise of existing staff	0.135	3
	Establishment of a cooperation system between non-disabled sports associations and disabled sports associations	0.078	4
	Recruitment of new on-site sports instructors	0.051	5
	Consistency ratio = 0.074		
Enhancing physical activity engagement	Strengthening promotion of physical activities for older adults with functional limitations	0.558	1
	Expansion of participation competitions	0.319	2
	Improving awareness of physical activity	0.123	3
	Consistency ratio = 0.019		
Establishment of an exchange system	Establishment of dedicated organizations for each field for efficient support	0.582	1
	Establishment of an inter-agency cooperation support system	0.309	2
	Expansion of linkage activities between organizations in each field	0.109	3
	Consistency ratio = 0.056		
Development of physical activity programs	Development of customized physical activity programs for each type of disability	0.637	1
	Development of physical activity programs using virtual environments	0.258	2

Activating connections between existing physical activity programs	0.105	3
Consistency ratio= 0.062		

3.2.3 Final Integrated Priorities

Table 6 presents the integrated priority weights across the AHP hierarchy. These values combine the relative weight of each strategic domain with the corresponding within-domain weight of each sub-factor. The integrated results represent experts' relative priority judgments. Among the 17 sub-factors, Establishment of a legal and institutional basis for physical activity promotion received the highest overall priority (0.285; rank 1). This was followed by strengthening promotion of physical activities for older adults with functional limitations (0.177; rank 2) and securing budget to promote physical activity (0.123; rank 3). Expansion of participation competitions ranked fourth (0.101), followed by establishment of dedicated organizations for each field for efficient support (0.089) and establishment of an inter-agency cooperation support system (0.048).

The lower-ranked sub-factors included connection to existing sports facilities with attention to accessibility (securing accessibility; 0.026), securing sports facilities exclusively for older adults with functional limitations (0.013), retraining and strengthening the expertise of existing staff (0.007), establishment of a cooperation system between non-disabled sports associations and disabled sports associations (0.004), recruitment of new on-site sports instructors (0.003), and other relatively lower-weighted program and policy sub-factors. These results indicate that the experts did not assign equal priority to all 17 strategic factors.

Table 6. Integrated priority weights and ranks of the 17 sub-factors

Category	Sub-factors	Final priorities	Final ranks
Strengthening Legal, Institutional, and Policy Support	Establishment of a legal and institutional basis for physical activity promotion	0.285	1
	Securing budget to promote physical activity for older adults with functional limitations	0.123	3
	Measures for policy connection (including mid- to long-term plans by sector)	0.032	8
Securing infrastructure	Connection to existing sports facilities with attention to accessibility with attention to accessibility (securing accessibility)	0.026	9
	Securing sports facilities exclusively for older adults with functional limitations	0.013	12
	Retraining and strengthening the expertise of existing staff	0.007	14
	Establishment of cooperation system between non-disabled sports association and disabled sports association	0.004	15
	Recruitment of new on-site sports instructors	0.003	17
Enhancing physical activity engagement	Strengthening promotion of physical activities for older adults with functional limitations	0.177	2
	Expansion of participation competitions	0.101	4
	Improving awareness of physical activity	0.039	7
Establishment of an exchange system	Establishment of dedicated organizations for each field for efficient support	0.089	5
	Establishment of an inter-agency cooperation support system	0.048	6
	Expansion of linkage activities between organizations in each field	0.017	11
Development of physical activity programs	Development of customized physical activity programs for each type of disability	0.023	10
	Development of physical activity programs using virtual environments	0.009	13
	Activating connections between existing physical activity programs	0.004	16

Discussion

This study identified and prioritized strategic factors for promoting physical activity among older adults with functional limitations in the post-COVID-19 context by integrating FGIs with AHP. The FGI analysis produced five strategic domains and 17 sub-factors across policy, community, organizational, interpersonal, and individual levels. The AHP results showed a distinct pattern of relative priority: Strengthening Legal, Institutional, and Policy Support ranked first among the five strategic domains (0.439), followed by enhancing physical activity engagement (0.318), establishment of an exchange system (0.154), securing infrastructure (0.053), and development of physical activity programs (0.036).

At the sub-factor level, the establishment of a legal and institutional basis for physical activity promotion had the highest global weight (0.285), followed by strengthening promotional activities (0.177) and securing budgetary support (0.123). These results should be interpreted as experts' judgments of relative strategic priority rather than as evidence of causal effects or intervention effectiveness.

At the policy level, strengthening legal, institutional, and policy support received the highest domain priority. Within this domain, the establishment of a legal and institutional basis for physical activity promotion was ranked first among all 17 sub-factors, while securing budget for physical activity promotion ranked third overall. This pattern indicates that the expert panel placed substantial emphasis on formal policy frameworks and financial support when considering strategies for inclusive physical activity promotion. Previous research has emphasized the importance of institutional governance and advocacy in expanding sports participation opportunities for people with disabilities (23). The WHO guidelines likewise emphasize policy and environmental approaches as components of population-level physical activity promotion (24). Policy prioritization methods have also been used to structure choices among competing strategic options in complex policy settings (25). In this context, the present findings provide a priority-setting perspective: experts placed formal institutional support and financial resources relatively high compared with several organizational and program-specific options.

The community-level results further highlight the importance of coordination among organizations. Establishment of dedicated organizations for each field for efficient support received the highest within-domain priority (0.582), followed by establishment of an inter-agency cooperation support system (0.309) and expansion of linkage activities between organizations in each field (0.109). Previous research has highlighted the value of partnerships among sports organizations, healthcare providers, welfare institutions, and local governments when addressing complex physical activity needs among people with disabilities and people aging with mobility disabilities (12, 26).

The present findings are consistent with this literature while adding a relative-priority perspective. Rather than treating inter-organizational coordination as a secondary administrative issue, the expert panel placed dedicated support organizations and inter-agency cooperation among the higher-priority community strategies.

At the organizational level, securing infrastructure received a lower domain priority (0.053) than policy, interpersonal, and community domains. Nevertheless, accessibility to existing sports facilities was the highest-priority sub-factor within the infrastructure domain (0.483). Securing dedicated facilities

followed (0.253), while retraining existing human resources (0.135), establishing cooperation between non-disabled and disabled sports associations (0.078), and recruiting new on-site sports instructors (0.051) received lower within-domain priorities. This pattern suggests that, when organizational strategies are compared with one another, improving the usability and accessibility of existing facilities may be viewed as a more immediate priority than expanding the physical infrastructure base.

This interpretation is compatible with previous evidence identifying environmental accessibility and limited professional support as important barriers to physical activity participation among people with disabilities (13). More broadly, aging, chronic conditions, and functional limitations have been discussed as important contextual considerations for health and service planning in later life (27, 28). At the interpersonal level, enhancing physical activity engagement received the second-highest domain priority (0.318). Strengthening promotion of physical activities received the highest within-domain priority (0.558), followed by expansion of participation competitions (0.319) and improving awareness of physical activity (0.123). Previous studies have reported associations between social participation, group-based activities, and well-being among older adults, while research involving people with disabilities has also emphasized accessible recreational and sport opportunities (8, 14, 29, 30). The present findings extend these observations by showing that experts placed communication, promotion, and participation-oriented activities relatively high within the overall prioritization structure. At the individual level, development of physical activity programs received the lowest domain priority (0.036), although the domain contained a highly prioritized sub-factor within its own level: development of customized physical activity programs for each type of disability (0.637). Development of programs using virtual environments (0.258) and activating connections between existing physical activity programs (0.105) received lower within-domain weights. Thus, the relatively low domain weight should not be interpreted as indicating that individualized programming is unimportant. Rather, it indicates that, in the aggregate expert judgment, the individual-level domain received less relative priority than the other four domains. Customized programming remained the highest-priority option within that domain.

Evidence on lifestyle interventions and structured physical activity also supports the relevance of individualized approaches in healthy aging and chronic disease prevention (33, 34). The prioritization of virtual-environment programs is also relevant to the post-COVID-19 context. The pandemic accelerated interest in digital health technologies and remote physical activity delivery, while restrictions also exposed differences in access and usability among people with disabilities (31, 32). The relatively modest global weight assigned to virtual-environment programs in the present study (0.009) suggests that experts regarded this option as one component of a broader strategy rather than as the primary priority. This result may be useful for policy planning because digital delivery can complement, rather than replace, accessible in-person opportunities.

Taken together, the five-domain structure supports a multi-level approach consistent with the socio-ecological model (15). The model is useful here as an organizing framework for identifying implementation levels and strategic options. The AHP results show that experts did not assign equal relative priority to these levels. In particular, policy-level strategies received the highest domain weight,

while organizational infrastructure and individual program development received lower aggregate weights. However, the AHP hierarchy does not establish that one level must be implemented before another, nor does it demonstrate that higher-ranked strategies cause improvements in physical activity. The observed ranking should therefore be understood as a structured expression of expert preference under the conditions of this study.

Several policy implications follow from this prioritization pattern. First, policy planners may consider strengthening legal and institutional frameworks that support equitable access to physical activity opportunities for older adults with functional limitations. Second, financial planning may need to accompany policy development because securing budgetary support ranked third among all 17 sub-factors. Third, cross-sectoral coordination involving health, sports, welfare, and community organizations should be considered alongside formal policy measures. Fourth, existing sports facilities may be considered for accessibility improvements alongside efforts to expand dedicated infrastructure. Finally, promotion, participation-oriented activities, and individualized programming can be incorporated as complementary components of a multi-level strategy.

The findings may also have relevance beyond South Korea, particularly for countries experiencing rapid population aging and growing demand for inclusive physical activity systems. However, the transferability of the specific priority rankings should be considered cautiously because policy structures, service-delivery systems, disability-sport organizations, and resource environments differ across countries. The broader post-pandemic context also includes continuing concerns about stress resilience and mental health among populations affected by prolonged COVID-19 disruption (35). The results are most appropriately viewed as a framework for structured priority setting that can be adapted and reassessed in other contexts.

This study has several limitations. First, the expert panel consisted of 20 participants, and only 18 responses met the prespecified AHP consistency criterion. The relatively small and purposively selected panel may limit generalizability. Second, the panel included researchers and practitioners but not policymakers or older adults with functional limitations. The absence of the latter group means that lived experiences and user-defined priorities were not directly represented. Third, the AHP results reflect expert judgments of relative priority and therefore do not establish causal relationships, intervention effectiveness, or the temporal sequence in which strategies should be implemented. Fourth, the study was conducted in South Korea, and the priority structure may not transfer directly to other institutional and cultural settings. Future research should incorporate the perspectives of older adults with functional limitations and policymakers, and should examine whether the prioritized strategies are associated with measurable changes in physical activity participation and related outcomes through implementation and longitudinal research.

Conclusions

This study identified 17 strategic factors across five socio-ecological levels for promoting physical activity among older adults with functional limitations and assessed their relative priority using AHP. The five strategic domains were strengthening legal, institutional, and policy support, enhancing physical activity engagement, establishment of an exchange system, securing infrastructure, and development of physical activity programs. Among these domains, Strengthening Legal, Institutional, and Policy Support received the highest priority (0.439). At the sub-factor level, the establishment of a legal and institutional basis for physical activity promotion received the highest global priority (0.285), followed by strengthening promotion of physical activities (0.177) and securing budgetary support (0.123). The findings indicate that experts placed relatively greater priority on policy and institutional strategies than on infrastructure expansion or program-level strategies. This pattern provides a structured basis for multi-level priority setting but should not be interpreted as evidence of causal ordering or intervention effectiveness. Future research should incorporate the perspectives of older adults with functional limitations and policymakers and evaluate the implementation and effectiveness of the prioritized strategies in different settings.

Abbreviations

AHP: Analytic Hierarchy Process;

CR: consistency ratio;

FGI: focus group interview.

Declarations

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

This research received no external funding.

Authors' contributions

KHC conceived and designed the study. AK contributed to the literature review and interpretation of the findings. CL supervised the study, reviewed the manuscript, and provided critical revisions. All authors read and approved the final manuscript.

Acknowledgements

Not applicable.

Ethics approval and consent to participate

Ethical approval was not required for this study under the Bioethics and Safety Act of the Republic of Korea because the research involved professional experts participating in focus group interviews and survey-based priority assessments and did not collect sensitive personal information or involve interventions. Participation was voluntary, and all participants were informed about the purpose of the study, procedures, confidentiality measures, and their right to withdraw at any time. Written informed consent was obtained from all participants prior to participation.

Generative AI Statement

Generative AI tools were not used in the conduct of this research, including study design, data collection, data analysis, or interpretation of the findings. Generative AI tools were also not used to generate or substantially modify the manuscript.

Clinical trial number

Not applicable

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