



Review Article

## Health Literacy, Physical Activity, and Education: Integrating Healthcare and Pedagogical Perspectives

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### Abstract

**Background.** Health literacy (HL) is a multidimensional construct recognized as a key determinant of health outcomes, influencing individuals' ability to access, understand, and apply health information. However, existing literature predominantly describes associations between HL and health behaviours, while the mechanisms through which HL produces behavioural change, particularly in physical activity, remain insufficiently specified. In addition, the contextual conditions under which these effects operate, weaken, or fail have not been clearly defined.

**Objective.** This narrative review aims to develop a mechanism-based and condition-sensitive conceptual model integrating healthcare, pedagogical, and physical activity perspectives to explain how, why, and under which conditions HL influences health behaviour, with specific reference to physical activity.

**Materials and Methods.** A structured narrative review was conducted using the PubMed, Scopus, and Web of Science databases. Studies published between 2000 and 2025 were selected based on predefined inclusion and exclusion criteria. The analysis followed a theory-driven synthesis approach aimed at identifying causal pathways, mediating processes, and contextual moderators.

**Results.** The synthesis identifies a multilevel mechanism through which HL influences physical activity and health behaviours via cognitive, motivational, and behavioural regulation processes. However, this mechanism is conditional rather than universal: its effectiveness depends on contextual factors such as educational level, socio-economic status, healthcare system complexity, and digital access. HL effects are strengthened in supportive environments, attenuated in complex communication contexts, and may fail in the presence of structural constraints.

**Conclusions.** HL should be conceptualized not only as a determinant but also as a conditional mechanism of behaviour change operating across healthcare, educational, and social systems. The proposed model provides a theoretically grounded framework with defined causal pathways, mediators, and boundary conditions, offering guidance for the design of integrated interventions to improve health outcomes, promote active lifestyles, and reduce health inequalities.

**Keywords:** health literacy, patient education, health promotion, physical activity, physical education, sport, empowerment, healthcare systems, public health.

### Introduction

Health literacy (HL) is increasingly recognized as a central determinant of health and a key component of healthcare systems. Originally it was defined as the ability to read and understand basic health information; in more

recent times, the concept has evolved into a multidimensional construct that affects different aspects, such as cognitive, social, and critical skills required for informed decision-making (Nutbeam, 2008).

In recent Public Health research, HL is not considered a static individual attribute but a dynamic interaction between individuals and healthcare, educational, and social systems.

The growing importance attributed to HL is closely linked to the transformations in healthcare, including aging populations, the rise of chronic diseases, etc. In this context,

patients are expected to take a more active role in managing their health, and in making decisions (Kickbusch & Maag, 2008).

Despite its recognized importance, current research on HL remains fragmented. Indeed, HL has been predominantly investigated within clinical and Public Health settings, while parallel developments in educational sciences and physical activity research have often evolved independently. As a result, there is limited integration between healthcare-oriented HL models, pedagogical theories of learning and empowerment, and behavioural frameworks related to physical activity and sport participation.

Furthermore, HL is also related to lifestyle behaviours, including physical activity and sport participation. Adequate levels of HL enable individuals to better understand the benefits of regular exercise, interpret public health guidelines, and adopt active lifestyles, as highlighted by the World Health Organization (2018). Conversely, limited HL may contribute to sedentary behaviours and poor engagement in preventive practices, including unhealthy lifestyle patterns such as poor diet and physical inactivity (Paasche-Orlow & Wolf, 2007; Calella et al., 2024). In this perspective, physical activity represents not only a determinant of health but also an educational context in which individuals develop skills related to self-management, body awareness, and informed decision-making. Participation in sport and physical education has been associated with improved physical, psychological, and social outcomes, reinforcing its relevance within health promotion strategies (Bailey, 2006).

At the same time, HL is associated to social determinants such as education, socioeconomic status, and cultural background, that could contribute to health inequalities (Paasche-Orlow & Wolf, 2007).

Despite the considerable clinical implications, HL has also a pedagogical dimension. Indeed, it involves learning processes, communication strategies, and the development of competencies during lifetime. Therefore, healthcare workers (HCWs) are required not only to provide care but also to facilitate understanding and promote patient empowerment (World Health Organization, 2013).

In addition, the rapid expansion of digital technologies has led to the emergence of digital health literacy (DHL), which refers to individuals' ability to seek, understand, and use health information from electronic sources. DHL is increasingly recognized as a key determinant of health in contemporary societies, influencing access to care, self-management, and health-related decision-making.

Despite the expansion of HL research across healthcare, education, and behavioural domains, current literature predominantly establishes associative relationships rather than explanatory mechanisms. Systematic reviews by Berkman et al. (2011) and conceptual analyses by Baker (2006) consistently demonstrate strong associations between HL and health outcomes, yet they do not fully explain how these relationships are produced. While HL is linked to physical activity and preventive behaviours (World Health Organization, 2018), there is limited understanding of how HL translates into behavioural change through identifiable causal pathways. Moreover, the conditions under which these relationships operate, weaken, or fail remain insufficiently specified.

This limitation constrains both theoretical advancement and practical application, as interventions based on HL often

assume linear effects without accounting for mediating processes and contextual dependencies. Paasche-Orlow and Wolf (2007) proposed one of the few causal pathway models linking HL to health outcomes, emphasizing intermediate factors such as access, communication, and self-management; however, these mechanisms have not been fully integrated with educational and behavioural frameworks. Similarly, Sørensen et al. (2012) conceptualize HL as a multidimensional construct shaped by individual and systemic factors, but without explicitly operationalizing its behavioural pathways.

In the context of physical activity, this gap is particularly evident. Although higher HL is associated with increased engagement in active lifestyles (World Health Organization, 2018), the processes through which knowledge is transformed into sustained behaviour, such as motivation, self-efficacy, and behavioural regulation are not systematically incorporated into HL models. Educational theories (Knowles et al., 2012) and communication-based approaches (Street et al., 2009) suggest that learning and interaction processes are central, yet these perspectives remain only partially connected to HL research. Furthermore, structural and contextual factors, including educational level and socio-economic conditions, are known to influence HL (Sørensen et al., 2012), but their role as moderators of behavioural outcomes is rarely explicitly defined.

Therefore, this study aims to move beyond descriptive synthesis by developing a mechanism-based and condition-sensitive conceptual model of HL. Specifically, the review seeks to: 1) identify the causal pathways linking HL to health behaviour, with particular focus on physical activity; 2) analyse the mediating processes through which HL influences behaviour; 3) define the contextual conditions under which these mechanisms operate, weaken, or fail.

By addressing these aspects, this study proposes an operational framework that integrates healthcare, educational, and behavioural perspectives, contributing to a more theoretically grounded and practically applicable understanding of HL.

## Materials and Methods

### Study design

This study was conducted as a structured narrative review with a theory-driven synthesis approach. Although narrative in structure, the review follows systematic principles of transparency, study selection, and theory-driven synthesis to enhance reproducibility and analytical rigor. The review was designed not only to summarize existing literature but to identify causal pathways, mediating mechanisms, and contextual conditions linking HL to health behaviour, particularly physical activity. This approach combines elements of scoping reviews with conceptual model development, ensuring both breadth of coverage and analytical depth.

### Literature search strategy

A comprehensive literature search was conducted in PubMed, Scopus, and Web of Science databases. The search covered studies published between 2000 and 2025. Search terms were combined using Boolean operators and included: ("health literacy") AND ("physical activity" OR "sport" OR

“lifestyle”) AND (“health education” OR “patient education” OR “physical education”).

The search strategy was designed to capture studies addressing HL across healthcare, educational, and behavioural domains. Reference lists of key articles were also screened to identify additional relevant studies.

#### *Eligibility criteria and study selection*

Studies were included if they met the following criteria: 1) peer-reviewed articles; 2) focus on HL in relation to healthcare, education, or physical activity; 3) contribution to understanding mechanisms, processes, or outcomes related to HL; and 4) published in English.

Studies were excluded if they were non-scientific publications, did not explicitly address HL, or lacked relevance to the conceptual integration of HL across domains.

The selection process was conducted in two stages: 1) title and abstract screening to identify potentially relevant studies; and 2) full-text assessment based on inclusion criteria. Although the review does not follow a formal systematic review protocol, the selection process was conducted to ensure transparency and reproducibility. To enhance consistency, the selection process was guided by predefined conceptual criteria focusing on the relevance of studies for identifying mechanisms, mediating processes, and contextual conditions. Emphasis was placed on studies providing explanatory insights rather than purely descriptive associations. The selection process resulted in a focused set of studies that met the inclusion criteria and were considered sufficiently relevant for the development of the conceptual synthesis. Consistent with the narrative and theory-driven nature of the review, emphasis was placed on conceptual relevance and explanatory contribution rather than on quantitative reporting of study flow.

#### *Data extraction and synthesis*

Data were extracted focusing on three analytical dimensions: 1) reported relationships between HL and health outcomes or behaviours; 2) identified mediating processes (e.g., comprehension, self-efficacy, communication); and 3) contextual factors influencing these relationships.

The synthesis followed a theory-driven approach aimed at moving from descriptive aggregation to explanatory modelling. Studies were analysed to identify recurring causal patterns, which were then integrated into a mechanism-based conceptual framework specifying pathways, mediators, and boundary conditions.

Rather than aggregating results, the analysis aimed to construct a mechanism-based explanation by linking observed relationships to underlying processes and conditions. This approach supports the development of a conceptual model that is theoretically grounded while remaining open to empirical validation.

## **Results**

#### *Study selection and overview of included literature*

The literature search yielded a heterogeneous body of literature across healthcare, educational, and physical activity domains. A focused subset of studies meeting the inclusion criteria was selected and analysed using a theory-

driven synthesis approach. The selected literature reflects heterogeneous methodological approaches, including systematic reviews, observational studies, theoretical frameworks, and intervention studies, highlighting the multidimensional nature of HL.

Across the included studies, HL was conceptualized as a multidimensional construct involving healthcare systems, individual competencies, and educational contexts (Nutbeam, 2000; Sørensen et al., 2012).

#### *Mechanism-based synthesis of health literacy*

The synthesis of the included studies moves beyond thematic aggregation to identify a mechanism-based explanation of how HL influences health behaviour, particularly physical activity. Across the literature, HL does not operate as a direct determinant of behaviour, but rather through a set of interacting cognitive, motivational, and behavioural regulation processes.

At the cognitive level, HL enables individuals to access, understand, and interpret health information. Berkman et al. (2011) demonstrate that limited HL is associated with misunderstanding of medical instructions and poor disease knowledge, while Baker (2006) highlights its role in shaping healthcare decision-making. These findings suggest that comprehension represents a primary mechanism through which HL affects subsequent processes.

Limited HL is also associated with increased healthcare costs, reflecting inefficient use of services and poorer disease management (Eichler et al., 2009).

At the motivational level, HL contributes to the development of self-efficacy, risk perception, and outcome expectations. Osborn et al. (2011) show that HL influences patients' confidence in managing their health, while educational theories (Knowles et al., 2012) emphasize the role of learning processes in fostering autonomy and motivation. These elements are critical in translating knowledge into intention.

At the behavioural level, HL affects self-management, adherence, and lifestyle choices. Paasche-Orlow and Wolf (2007) propose that HL influences health outcomes through intermediate pathways including access to care, patient-provider interaction, and self-care behaviours. In the context of physical activity, the World Health Organization (2018) indicates that individuals with higher HL are more likely to engage in preventive behaviours, although this relationship is not linear or universal.

The concept of physical literacy further supports this interpretation, integrating cognitive, motivational, and behavioural dimensions of lifelong physical activity engagement (Whitehead, 2010). This multidimensional perspective is supported by systematic evidence linking physical literacy to motivation, competence, and long-term engagement in physical activity (Edwards et al., 2017).

Taken together, these findings support a multilevel mechanism in which HL influences behaviour through a sequential pathway: cognitive processing (comprehension); motivational activation (self-efficacy and intention); behavioural regulation (action and maintenance).

#### *Conditions of operation*

The analysis further indicates that the effect of HL on behaviour is conditional rather than universal. Specifically,

three patterns can be identified: conditions under which HL operates effectively, conditions under which its effect weakens, and conditions under which it fails.

HL operates effectively when individuals are supported by enabling environments, including accessible healthcare systems, clear communication, and adequate educational background. Sørensen et al. (2012) emphasize that HL emerges from the interaction between individual capacities and system demands, suggesting that alignment between these elements is necessary for effective outcomes.

The effect of HL weakens in contexts characterized by complexity and limited support. Street et al. (2009) show that ineffective communication between healthcare providers and patients can reduce comprehension and limit the impact of HL. Similarly, low motivation or lack of reinforcement may prevent the translation of knowledge into sustained behaviour, particularly in physical activity contexts.

HL may fail to produce behavioural change in the presence of structural barriers. Socio-economic constraints, low educational attainment, and limited access to resources can inhibit the application of health knowledge, even when HL levels are adequate. In such cases, HL alone is insufficient to generate change, as behavioural outcomes are constrained by external conditions rather than individual competence.

### Integrative model

Based on these findings, HL can be conceptualized as a conditional mechanism linking healthcare systems, educational processes, and behavioural outcomes. The proposed model integrates three core components: 1) causal pathways (cognitive, motivational, behavioural), 2) mediating processes (comprehension, self-efficacy, regulation), and 3) contextual moderators (education, socio-economic conditions, system complexity).

This model moves beyond illustrative representations by specifying how HL produces effects and under which conditions these effects vary, providing an operational framework for future research and interventions.

Table 1 synthesizes the mechanism-based structure of the included studies, highlighting main component, mechanism, and implications.

Table 1 synthesizes the findings according to a mechanism-based framework, identifying the core processes through which HL influences health behaviour. Rather than organizing evidence into thematic domains, the table highlights the sequential pathways (cognitive, motivational,

and behavioural), the key mediating elements, and the contextual conditions that shape the strength and direction of these relationships.

Figure 1 presents the operational framework of this model, illustrating the sequential pathways through which HL influences behaviour and the contextual conditions under which these processes operate. The proposed framework conceptualizes HL as a conditional mechanism integrating causal pathways, mediating processes, and contextual moderators

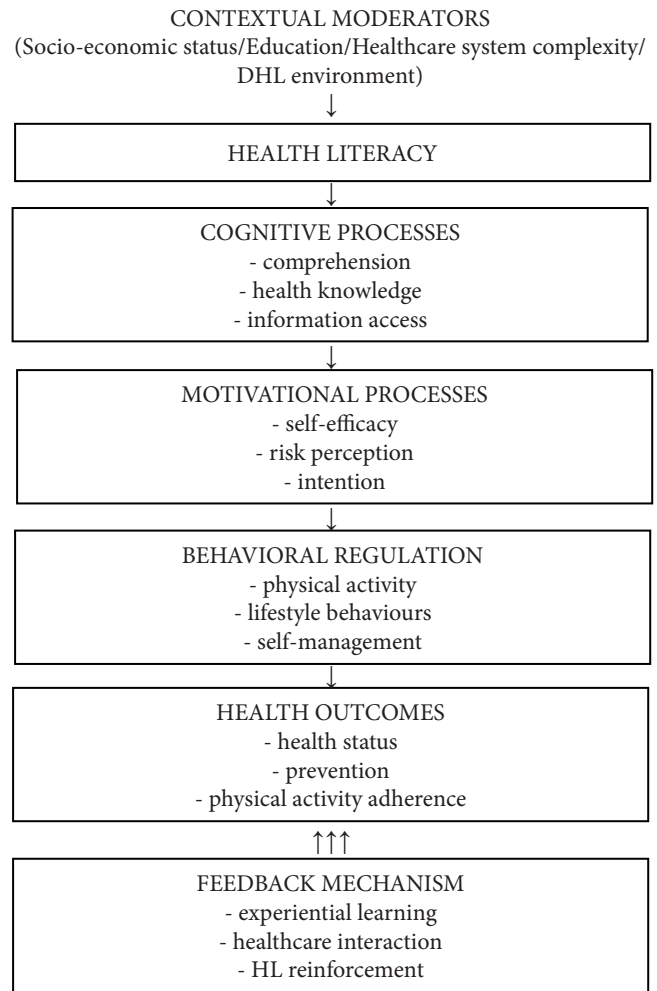


Fig. 1. Conceptual model of HL

Table 1. Synthesis of HL literature across domains

Component	Mechanism	Key elements	Supporting evidence
Cognitive processes	Access, understanding, and interpretation of health information	Comprehension, health knowledge	Berkman et al. (2011); Baker (2006)
Motivational processes	Transformation of knowledge into intention	Self-efficacy, risk perception, motivation	Osborn et al. (2011); Knowles et al. (2012)
Behavioral regulation	Translation of intention into action	Physical activity, self-management, adherence	Paasche-Orlow & Wolf (2007); World Health Organization (2018)
Contextual moderators	Conditions influencing the strength of the relationship	Education, socio-economic status, healthcare system complexity, digital access	Sørensen et al. (2012); Street et al. (2009)
Boundary conditions	Conditions of effectiveness, weakening, or failure	Supportive vs constrained environments	Derived from theory-driven synthesis

## Discussion

This review moves beyond a descriptive synthesis by integrating evidence on HL across healthcare, educational, and physical activity domains. The main contribution of this study lies in framing HL as an interdisciplinary and dynamic construct that operates across systems rather than as an isolated individual competency.

The findings suggest that HL should be interpreted as a multilevel construct emerging from the interaction between individual abilities, healthcare system demands, and educational contexts. This perspective aligns with existing theoretical models that conceptualize HL as both an individual and a systems-level attribute (Nutbeam, 2000; Sørensen et al., 2012).

This study advances the literature by moving from associative descriptions of HL to a mechanism-based and condition-sensitive explanation of its effects on health behaviour. The findings indicate that HL does not act as a direct determinant of outcomes, but as a multilevel mechanism operating through cognitive, motivational, and behavioural regulation processes. This interpretation extends previous models, such as that proposed by Paasche-Orlow and Wolf (2007), by explicitly integrating educational and behavioural dimensions within a unified framework.

From a theoretical perspective, the results support the conceptualization of HL as a conditional mechanism rather than a static individual attribute. Specifically, HL enables behavioural change only when cognitive understanding is translated into motivation and subsequently into action. This sequential process highlights the central role of mediators such as comprehension and self-efficacy, which bridge the gap between knowledge and behaviour. Importantly, the proposed mechanism should not be interpreted as a strictly linear sequence, but as a dynamic and recursive system of interactions. HL not only influences cognitive, motivational, and behavioural processes, but is also progressively reshaped by individual lived experiences in health-related and physical activity contexts. In this sense, behavioural outcomes may generate feedback effects that contribute to the refinement of health-related knowledge, self-efficacy, and future decision-making capacity. This bidirectional perspective suggests that HL operates within a continuous learning loop rather than a unidirectional causal pathway.

Based on this synthesis, the following theoretical statements are proposed:

**Statement 1:** HL is associated with health behaviour through sequential mediating processes involving cognitive comprehension, motivational activation (e.g., self-efficacy), and behavioural regulation; however, these pathways are non-linear and may vary across contexts.

**Statement 2:** The relationship between HL and health behaviour is moderated by contextual factors such as educational level, socio-economic conditions, healthcare system complexity, and digital access, which influence the strength and direction of effects.

**Statement 3:** HL alone is insufficient to ensure sustained behavioural change when environmental, organisational, or structural constraints limit the translation of knowledge into action.

**Statement 4:** The translation of HL into physical activity behaviour is a dynamic process influenced by the interaction between individual capacities and contextual opportunities,

and it may be reinforced or weakened over time through feedback from behavioural experiences.

These statements define a set of boundary conditions that clarify when and how HL operates. In particular, the findings indicate that HL operates effectively in contexts characterized by accessible information, supportive communication, and adequate educational resources. Conversely, its effect weakens in complex or poorly structured systems and may fail entirely in the presence of structural barriers such as socio-economic disadvantage or limited access to resources.

This perspective has important implications for both theory and practice. From a theoretical standpoint, it contributes to the advancement of HL research by providing an operational model that specifies causal pathways and conditions of applicability. From a practical standpoint, it suggests that interventions should not focus solely on improving individual HL levels, but also on modifying contextual factors that enable or constrain behaviour.

Healthcare systems should adopt health-literate organizational models that reduce complexity and enhance communication (Brach et al., 2012), while educational systems should integrate HL as a core competence linked to critical thinking and lifelong learning (Nutbeam, 2008). In the domain of physical activity, interventions should explicitly target both HL and its mediating processes, such as motivation and self-regulation, in order to facilitate sustained engagement.

An additional implication concerns the role of DHL, which may amplify both opportunities and inequalities. While digital tools can enhance access to health information, they also require advanced critical evaluation skills and may exacerbate disparities among populations with limited resources or competencies. These dynamics introduce further challenges, including information overload, exposure to misinformation, and digital inequality.

These challenges may amplify existing disparities in HL and health outcomes if not addressed through targeted educational and system-level interventions.

The findings of this review could have several practical implications. For healthcare systems, HL should be integrated into organizational design through health literate healthcare systems that improve communication and navigation (Brach et al., 2012). For educational systems, HL should be incorporated into curricula as a lifelong learning competence linked to critical thinking and empowerment (World Health Organization, 2013). For physical activity and sport, interventions should explicitly integrate HL components to enhance understanding of health benefits, motivation for active lifestyles, and adherence to physical activity guidelines (World Health Organization, 2018; Bailey, 2006).

HCWs, educators, and sport practitioners should therefore be considered joint stakeholders in HL development.

### *Study limitations*

This review has several limitations related to its non-systematic approach and the potential for selection bias in the included literature. As a structured narrative review, it is subject to heterogeneity of included study designs, and absence of quantitative synthesis. Indeed, future research should focus on development and validation of integrated HL models, and longitudinal studies assessing HL impact on physical activity and health outcomes.

## Conclusion

HL is a fundamental determinant of health and a component of modern healthcare systems. Its integration with pedagogical approaches provides a powerful framework for improving health outcomes and contrasting inequalities. Rather than being confined to a single disciplinary domain, HL should be conceptualized as a dynamic mechanism influencing how individuals access, understand, and apply health information across contexts.

Efforts to enhance HL should involve people, HCWs, and healthcare systems, with the adoption of more comprehensive and interdisciplinary approaches.

The integration of HL with pedagogical approaches and physical activity frameworks provides a promising direction for improving health outcomes and reducing health inequalities. This review contributes to the field by proposing a synthesized conceptual interpretation and highlighting the need for an integrated model capable of guiding future research and practice.

## Conflicts of Interest

The authors declare no conflicts of interest.

## Ethics Statement

Ethical approval was not required because this study is a narrative review and did not involve human participants, personal data, or experimental procedures.

## Data Availability Statement

No new datasets were generated or analyzed in this study.

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## AI Transparency Statement

The authors used AI-assisted tools exclusively for language editing and proofreading. The authors take full responsibility for the content, interpretation, and conclusions of the manuscript.

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# Медична грамотність, фізична активність та освіта: інтеграція медичних і педагогічних підходів

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 7 с., 1 таб., 1 рис., 18 джерела.

**Передумови.** Медична грамотність (HL) є багатовимірним конструктом, який розглядається як ключовий чинник результатів здоров'я, оскільки впливає на здатність людини отримувати, розуміти та застосовувати інформацію про здоров'я. Однак наявна література переважно описує зв'язки між HL і поведінкою, пов'язаною зі здоров'ям, тоді як механізми, через які HL забезпечує поведінкові зміни, особливо у сфері фізичної активності, залишаються недостатньо визначеними. Крім того, контекстуальні умови, за яких ці ефекти проявляються, послаблюються або не спрацьовують, також не були чітко окреслені.

**Мета.** Це нарративне оглядове дослідження спрямоване на розроблення механізм-орієнтованої та чутливої до умов концептуальної моделі, що інтегрує медичні, педагогічні та фізкультурно-оздоровчі підходи для пояснення того, як, чому та за яких умов HL впливає на поведінку, пов'язану зі здоров'ям, з особливим акцентом на фізичну активність.

**Матеріали і методи.** Проведено структурований нарративний огляд із використанням баз даних PubMed, Scopus та Web of Science. Дослідження, опубліковані у 2000–2025 роках, відбиралися відповідно до попередньо визначених критеріїв включення та виключення. Аналіз здійснювався на основі теоретично орієнтованого синтезу, спрямованого на виявлення причинно-наслідкових шляхів, опосередковувальних процесів і контекстуальних модераторів.

**Результати.** Синтез дозволив виявити багаторівневий механізм, через який HL впливає на фізичну активність і поведінку, пов'язану зі здоров'ям, за допомогою когнітивних, мотиваційних і поведінково-регуляторних процесів. Водночас цей механізм має умовний, а не універсальний характер: його ефективність залежить від таких контекстуальних чинників, як рівень освіти, соціально-економічний статус, складність системи охорони здоров'я та цифрова доступність. Вплив HL посилюється у сприятливих середовищах, послаблюється в умовах складної комунікації та може не реалізуватися за наявності структурних обмежень.

**Висновки.** HL слід розглядати не лише як детермінанту, а й як умовний механізм поведінкових змін, що функціонує в системах охорони здоров'я, освіти та соціального середовища. Запропонована модель формує теоретично обґрунтовану основу з визначеними причинно-наслідковими шляхами, медіаторами та граничними умовами, що може бути використана для розроблення інтегрованих втручань, спрямованих на покращення результатів здоров'я, популяризацію активного способу життя та зменшення нерівності у сфері здоров'я.

**Ключові слова:** медична грамотність, навчання пацієнтів, зміцнення здоров'я, фізична активність, фізичне виховання, спорт, розширення можливостей, системи охорони здоров'я, громадське здоров'я.

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