

Review

Physical literacy in rural areas: opportunities identified through a scoping review using a Self-Determination Theory lens

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Abstract: Physical literacy is increasingly recognized as a key determinant of lifelong engagement in physical activity and health promotion. However, evidence on promoting physical literacy in rural contexts remains limited. This scoping review aimed to identify and map opportunities for promoting physical literacy in rural areas through the lens of Self-Determination Theory. A scoping review was conducted following the PRISMA Extension for Scoping Reviews guidelines and the Arksey and O'Malley methodological framework. Four electronic databases (PubMed/MEDLINE, Scopus, Web of Science, and SPORTDiscus) were searched for studies published between 2014 and 2026. Empirical studies investigating physical literacy, motivation for physical activity, or Self-Determination Theory-related motivational processes in rural populations were included. Data were synthesized descriptively and thematically. Fifteen studies met the inclusion criteria. Across the five categories analyzed, opportunities were interpreted in relation to autonomy, competence, and relatedness. However, this association was directly tested in only four of the fifteen studies, while in the others, it was inferred from self-determination theory (SDT). Overall, the opportunities centered on contextual adaptation, social cohesion, and the participation of the actors involved. Rural environments should be viewed not only as resource-limited settings but also as contexts offering unique opportunities to promote physical literacy and sustainable engagement in physical activity.

Keywords: Physical literacy, Rural communities, Self Determination Theory, Motivation for physical activity, Health promotion, Autonomous motivation, Community engagement, Active lifestyles

1. Introduction

Physical literacy (PL) represents a fundamental concept in promoting an active and healthy lifestyle throughout life. According to the generally accepted definition, PL refers to the motivation, confidence, physical competence, knowledge, and understanding necessary to value and take responsibility for engagement in physical activities across the lifespan [1]. PL integrates, physical, cognitive and social dimensions, providing a comprehensive perspective on human development through movement [2].

In the educational context, including rural areas, PL has been recognized as an innovative pedagogical model in physical education, capable of facilitating the development of students' essential skills and promoting sustained engagement in physical activity [2]. Recent research highlights that PL is not merely a set of motor skills but a multidimensional construct that influences both individuals' levels of physical activity and their overall well-being [3]. Empirical studies have shown that elements of PL centered on physical education demonstrate significant stability over time and correlate positively with objectively measured physical activity levels [4].

Beyond its educational dimension, PL is increasingly conceptualized as a lifelong development process, influenced by the interaction between individual characteristics and the contextual conditions in which participation in physical activity occurs. This perspective emphasizes that opportunities for developing PL are not distributed evenly but are shaped by socio-ecological factors such as residential environment, access to resources, community norms, and social support [2, 5].

Self-Determination Theory (SDT) provides a robust theoretical framework for understanding the motivational processes that support physical literacy. This theory postulates that satisfying fundamental psychological needs: autonomy, competence, and relatedness, is essential for developing intrinsic motivation and sustainable physical activity behavior [6, 7]. In the context of competence-based physical education, autonomy support plays an important role in developing physical literacy, with social-cognitive theory emphasizing the significance of the interaction between personal, behavioral, and environmental factors in this process [8, 9].

Integrating SDT into PL research allows not only for explaining levels of physical activity participation but also for understanding the mechanisms through which individuals develop an autonomous, sustainable, and meaningful relationship with movement. From this perspective, PL can be seen as an emergent outcome of environments that support autonomy, strengthen the sense of competence, and facilitate relatedness, which are central aspects within SDT.

The connection between PL and motivation is influenced by multiple factors, both at the personal level and within the context in which the activity takes place. Recent studies have highlighted that sports education programs can significantly improve perceived physical literacy, motivation, and physical activity levels among higher education students [1]. In addition, prior sports experience and regular engagement in physical exercise are positively associated with elements of physical literacy, even among physically inactive adults [10], suggesting that early interventions can have long-term effects on the development of this construct.

Both in rural and urban areas, PL influences both individual behaviors and values and attitudes toward physical activity at the family level. Recent research has shown that parents' PL can enhance children's values toward physical activity through a step-by-step mediation model, highlighting the importance of family-based approaches in promoting active lifestyles [11]. Moreover, at the individual level, PL is strongly associated with children's well-being, with physical activity acting as an important mediator in this relationship [3].

In the context of school physical education, measuring PL and its relationship with the intention to participate in extracurricular sports activities represents a major area of interest. Studies conducted on middle school students have identified significant associations between levels of PL and the intention to participate in interschool sports competitions, highlighting the potential of this construct to predict future engagement in physical activity [12].

However, most research on PL and SDT has been conducted in urban or suburban contexts, leaving a significant gap in understanding these concepts in rural settings. Rural areas present specific characteristics – limited access to sports facilities, long distances, reduced educational resources, distinct community cohesion – that can influence both the development of PL and the satisfaction of the basic psychological needs postulated by SDT.

Nevertheless, the rural environment should not be viewed exclusively through the lens of resource deficits. Features such as high community cohesion, close social relationships, opportunities for informal learning, and contextual autonomy can act as facilitators for the development of autonomous motivation and physical literacy, if appropriately leveraged. In this sense, the rural context represents a distinct environment, with potentially different motivational mechanisms compared to urban settings, which requires dedicated analysis.

Identifying opportunities to promote PL in rural areas through the lens of SDT is thus a practical and scientific necessity, essential for ensuring equity in access to quality physical education and a healthy lifestyle.

2. Methodology

2.1. Study Design

The present study was conducted as a scoping review in accordance with the PRISMA Extension for Scoping Reviews (PRISMA-ScR) [13] methodology and the conceptual framework proposed by Arksey & O'Malley (2005) [14], later refined by Levac et al. (2010) [15]. The choice of this type of review is justified by the need to: (a) systematically map the heterogeneous literature on PL and SDT in rural contexts; (b) identify knowledge gaps and opportunities for future research; and (c) synthesize evidence from studies with diverse methodological designs (quantitative, qualitative, mixed).

This approach is particularly suitable for emerging or fragmented fields, where the primary objective is to explore the scope, nature, and characteristics of the existing literature rather than to evaluate intervention effects or perform a quantitative synthesis.

The protocol for this scoping review was not registered, as PROSPERO currently does not accept scoping reviews. This approach aligns with established methodological recommendations for conducting and reporting scoping reviews.

2.2. Research Question and Objectives

The research question was formulated as follows: *“What evidence exists regarding opportunities for promoting PL in rural areas, and how do these relate to SDT principles?”*

The formulation of the research question and objectives was guided by the Population–Concept–Context (PCC) framework, recommended for scoping reviews, where the population targets individuals from rural communities, the central concept is PL and motivation explained through SDT, and the context is the rural environment.

The specific objectives of the scoping review were:

1. To identify empirical studies addressing PL and/or SDT in rural populations;
2. To map the types of interventions and programs implemented in rural contexts to promote physical activity;
3. To synthesize the barriers and facilitators for the development of PL in rural settings;
4. To identify gaps in the current research and formulate recommendations for future studies.

2.3. Literature Search Strategy

Databases consulted.

The systematic search was carried out in the following electronic databases, between December 15, 2025 and January 30, 2026: - PubMed/MEDLINE - Scopus - Web of Science (Core Collection) - SPORTDiscus (via EBSCOhost). Additionally, the following were consulted: - Reference lists of included articles (backward citation searching) - Citations of key articles (forward citation searching via Google Scholar) Note: Google Scholar was used exclusively for citation tracking and not as a primary search engine, to reduce the risk of including unvalidated grey literature.

Search strings.

The search strategy combined controlled terms (MeSH in PubMed) and free terms, adapted for each database. Example of a full string for PubMed: ("physical literacy" OR "movement literacy" OR "physical competence") AND ("SDT" OR "SDT" OR "autonomous motivation" OR "basic psychological needs") AND ("rural" OR "rural population" OR "rural community" OR "remote area" OR "countryside") AND ("physical activity"[MeSH] OR "exercise" OR "motor activity"). The primary search logic involved the mandatory combination of four thematic blocks: terms associated with physical literacy, SDT-related terms, rurality, and physical activity. However, accepting the implicit alignment with SDT within the eligibility criteria (Section 2.4) meant that this single search string could have become overly restrictive, potentially excluding both rural studies on physical literacy that lacked explicit SDT terminology and rural physical activity studies grounded in SDT but not using the phrase "physical literacy." To partially mitigate this limitation, forward and backward citation tracking was employed (Section 2.3), enabling the identification of additional works that did not appear in the results of the primary search string. The relationship between this search strategy and the broader eligibility criteria is discussed in detail in Section 4.6. The search strategy was developed iteratively and refined through pilot searches. The full electronic strategy for at least one database is available in the supplementary materials.

Limitations applied - January 2014 - January 2026 (search date) - Language: English - Publication type: articles in peer-reviewed journals (excluding: protocols, editorials, letters, conference abstracts) Justification for the 2014-2026 period: Although Whitehead (2010) [16] established the philosophical foundations of physical literacy and advocated for individualized progress-charting as the most appropriate form of assessment, the first standardised assessment instrument at the international level was the Canadian Assessment of Physical Literacy (CAPL), published in 2014 [17].

2.4. Inclusion Criteria

Studies were included in the review if they cumulatively met the following criteria:

- *Type of publication*
 - Scientific articles published in peer-reviewed journals;
 - Quantitative, qualitative, or mixed empirical studies.
- *Study population*
 - Children, adolescents, adults, or elderly individuals from rural communities;
 - Specific groups (e.g., people with chronic diseases, students, vulnerable populations) in predominantly rural contexts.
- *Topic*
 - Investigation of PL and/or motivation for physical activity;
 - Explicit or implicit use of SDT or compatible motivational frameworks;
 - Studies were considered eligible when the motivational constructs analysed could be conceptually aligned with SDT (e.g., autonomy, competence, relatedness), even if SDT was not explicitly mentioned. This approach is consistent with the scoping review methodology, which prioritizes breadth of coverage over theoretical homogeneity [14]. Given the emergent and fragmented nature of the field, excluding studies that operationalize SDT-compatible constructs without explicit theoretical labelling would have artificially narrowed the evidence base and obscured relevant patterns. The degree of conceptual alignment was assessed independently by both reviewers and discussed until consensus was reached. To highlight and monitor differences, the included studies were subsequently classified into four categories based on the degree of directness of the evidence: (a) direct evidence regarding physical literacy (PL)—i.e., studies explicitly measuring physical literacy using an established conceptual or assessment framework; (b) explicit evidence regarding self-determination theory (SDT)—specifi-

cally studies targeting autonomy, competence, and/or relatedness as dimensions of SDT; (c) implicit evidence compatible with SDT—manifested in studies addressing motivation or associated constructs without using specific SDT terminology, which were subsequently interpreted through the lens of the theory; and (d) contextual evidence regarding physical activity, namely studies examining participation in physical activities, as well as barriers and facilitators, without direct reference to PL or SDT constructs (see Table 3).

- Studies aimed at promoting physical activity, health, or well-being in rural areas.
- *Geographic setting*
 - Studies conducted in rural areas or including rural–urban comparisons with results reported separately for rural areas. The studies analyzed did not employ a unified classification system for rural areas (such as those of the OECD, the US Census Bureau, or Eurostat). Each study adopted the operational definition proposed by the original authors, resulting in considerable variation in how rurality was understood. Differences across North America, Europe, Asia, and Africa regarding population density, geographic isolation, infrastructure, transport, levels of socioeconomic deprivation, and access to services mean that the rural environment cannot be treated as a homogeneous exposure in this analysis. The specific definitions used in each study are presented in Table 3.
- *Publication period*
 - Articles published since 2014, to reflect relevant contemporary literature.
- *Language*
 - Articles published in English.

2.5. Exclusion Criteria

Studies were excluded from the analysis if they met one or more of the following criteria:

- Theoretical articles, editorials, commentaries, letters to the editor, or protocols without empirical data;
- Studies conducted exclusively in urban settings, without separate reporting for rural areas;
- Research addressing physical activity without connection to motivation, physical literacy, or relevant theoretical frameworks;
- Publications with limited access to full text, preventing assessment of eligibility and extraction of relevant data;
- Studies published in languages other than English.

2.6. Study selection process

This approach was carried out in accordance with the PRISMA-ScR guideline [13] and included a rigorous approach carried out in several successive stages. All identified records were initially imported into the bibliographic management software Mendeley (version 1.19.8), where duplicates were automatically removed, and subsequently manually checked for accuracy. Subsequently, two people independently screened the titles and abstracts, applying the established eligibility criteria. Any inconsistencies were discussed until consensus was reached, and articles for which there was uncertainty were directed to the full-text assessment.

In the next stage, the same reviewers independently analysed the full-text articles, documenting the reasons for exclusion for each rejected study. The level of agreement between the reviewers was very high, as indicated by a calculated Cohen's kappa coefficient ($\kappa = 0.89$), reflecting near-perfect agreement. The final list of included studies was then checked by a third person to ensure consistency of application of the criteria

and accuracy of selection. The entire process is summarized in the PRISMA flowchart (Figure 1).

2.7. Assessment of methodological quality

The methodological quality of the included studies was assessed using the Mixed Methods Appraisal Tool (MMAT), version 2018 [18]. The MMAT assesses quality through 5 specific criteria for each category:

- Randomized quantitative studies (5 criteria);
- Non-randomized quantitative studies (5 criteria);
- Descriptive quantitative studies (5 criteria);
- Qualitative studies (5 criteria);
- Mixed studies (5 criteria) Each criterion is scored Yes/No/Cannot be determined.

The methodological quality assessment was conducted solely for descriptive and interpretative purposes, to characterize the nature and overall robustness of the available evidence, in accordance with the recommendations for conducting scoping reviews (table 1).

According to the principles specific to scoping reviews, no studies were excluded based on the methodological quality assessment.

The MMAT assessment was conducted independently by two reviewers, and the level of inter-reviewer agreement was very high (Cohen's kappa coefficient = 0.82), indicating almost perfect agreement [19].

Table 1 - Methodological assessment (MMAT) – reported strengths and limitations (descriptive approach)

No.	Study (authors, year)	Type of study according to MMAT	Relevant MMAT criteria (strengths/limitations)
1	Beck et al., 2019 [20]	Quantitative Randomized (Cluster RCT)	Adequate randomization; clearly described intervention; incomplete data on effect size
2	De Man et al., 2020 [21]	Quantitative Non-Randomized (Cross-Sectional)	Valid SDT measures; appropriate statistical analysis; cross-sectional design – limited causality
3	Jones et al., 2020 [22]	Quantitative Randomized	Well-defined population; theory–variable coherence; small sample size
4	Christiana et al., 2014 [23]	Quantitative Non-Randomized	Validated instruments; rigorous analysis; self-reported physical literacy
5	Gavarkovs et al., 2017 [24]	Quantitative Descriptive	Clarity in objectives; internal consistency; lack of explicit theoretical framework
6	Gendemeh & Khajuria, 2025 [25]	Quantitative Comparative	Clearly defined groups; rural–urban comparison; limited control of confounding factors
7	Watkins et al., 2025a [26]	Quantitative Non-Randomized	Validated psychological instruments; multivariate analysis; cross-sectional design
8	Hadier et al., 2025 [27]	Quantitative Descriptive (Normative)	Large sample; standardized procedures; limited regional generalizability
9	Mayordomo-Pinilla et al., 2025 [28]	Quantitative Non-Randomized	Variable–objective coherence; preliminary analysis; low statistical power
10	Watkins et al., 2025b [29]	Qualitative (Participatory Co-Design)	Methodological rigor; analytic transparency; thematic saturation
11	Pelletier et al., 2025 [30]	Mixed (BCW)	Coherent integration of qualitative–quantitative; solid theoretical framework
12	Till et al., 2025 [31]	Qualitative / Mixed	Well-described extreme rural context; uneven reporting across districts
13	Greeven et al., 2023 [32]	Mixed (Needs Assessment)	Method integration; explicit SDT; triangulation
14	Chen et al., 2024 [33]	Quantitative Non-Randomized (Cross-Sectional)	Validated instruments; explicit SDT framework; cross-sectional design – limited causality
15	Yin et al., 2023 [34]	Quantitative Interventional	Clear objectives; incomplete methodological reporting

Note. MMAT = Mixed Methods Appraisal Tool [18]; RCT = Randomized Controlled Trial; BCW = Behaviour Change Wheel. Study types are classified according to MMAT version 2018

criteria: Quantitative Randomized, Quantitative Non-Randomized, Quantitative Descriptive, Qualitative, and Mixed Methods. Strengths and limitations reported are based on independent dual-reviewer assessment; inter-rater agreement was high (Cohen's $\kappa = 0.82$). Quality assessment was conducted for descriptive purposes only and did not serve as grounds for study exclusion, consistent with scoping review methodology [13,14]. SDT = Self-Determination Theory; PL = Physical Literacy.

2.8. Data synthesis

The data were synthesized narratively and in tabular form, following:

- type and design of studies;
- populations investigated;
- theoretical frameworks used;
- main reported results on physical literacy, motivation and physical activity in rural areas.

In addition, the results were organized into thematic categories, to highlight recurring patterns, barriers and opportunities identified in the reviewed literature, in line with the objectives of the field review. In the presentation of results, findings are explicitly aligned with the classification of evidence types introduced in Section 2.4. Statements regarding physical literacy (PL) are based exclusively on studies where PL was directly measured using an established conceptual framework or assessment tool (Table 3, "Type of evidence proposed" = direct evidence regarding PL). Conversely, studies analyzing physical activity participation, motivation, or health literacy without employing a validated PL measurement tool are treated as evidence concerning physical activity or motivation and are not considered equivalent to an improvement in PL.

3. Results

3.1. Results of the study selection process

The systematic literature search identified an initial number of records from electronic databases and additional sources. After removing duplicates and applying eligibility criteria at the title and abstract levels, a limited number of articles were selected for full-text review. Following full-text review, a total of 15 studies met the inclusion criteria and were included in the scoping review. The selection process is detailed in the PRISMA flow chart (Figure 1).

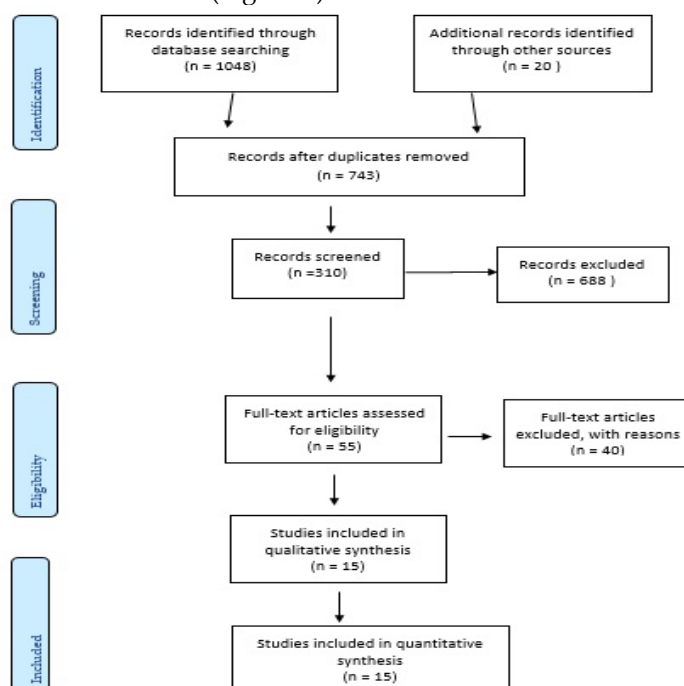


Figure 1. PRISMA diagram

3.2. Descriptive characteristics of included studies

3.2.1. Distribution of included studies

The descriptive characteristics of the included studies are summarized in Table 2, providing an overview of the type of evidence available in the current literature on PL and SDT in rural areas.

Table 2. Summary table - distribution by categories

Category	Number of studies	Percentage
Study design		
RCT / Cluster RCT	1	6.7%
Cross-Sectional	6	40.0%
Qualitative / Mixed	4	26.7%
Descriptive / Observational	2	13.3%
Other Designs	2	13.3%
Theoretical framework		
Explicit SDT	4	26.7%
Other Theories	3	20.0%
No Explicit Framework	8	53.3%
Target population		
Children / Adolescents	7	46.7%
Adults	3	20.0%
Older Adults	1	6.7%
Specific Populations (e.g., diabetes, students)	2	13.3%
Communities / Multiple Groups	2	13.3%
Geographic Region		
North America (USA, Canada)	7	46.7%
Asia (India, Pakistan, China, Uganda)	4	26.7%
Europe (Germany, Spain)	2	13.3%
Africa (South Africa, Uganda)	2	13.3%

Note. RCT = Randomized Controlled Trial. Percentages may not sum to 100% due to rounding. SDT = Self-Determination Theory

From a methodological design perspective, most studies were observational in nature, especially cross-sectional, indicating a predominantly descriptive orientation of existing research. Interventional studies, including randomized or cluster-randomized studies, were less frequently represented, suggesting a limited volume of research focused on testing structured interventions in rural contexts. Qualitative and mixed-methods studies offered complementary perspectives, focusing on participants' experiences, perceived barriers, and contextual mechanisms associated with physical activity participation.

Regarding the use of theoretical frameworks, only a portion of the included studies explicitly applied SDT, while a considerable number of studies addressed motivation, physical activity behaviors, or PL without anchoring them in a formalized theoretical framework. This theoretical heterogeneity reflects the still emerging stage of the field and the diversity of approaches used to investigate the phenomena studied in rural settings.

Analysis of the populations investigated indicates a concentration of research on children and adolescents in rural communities, followed by studies on adults and, to a lesser extent, on older adults or specific groups (e.g., people with chronic diseases or students). Geographically, most studies were conducted in North America, with more limited representation from Europe, Asia, and Africa, highlighting an uneven distribution of research globally.

3.2.2. Characteristics of individual studies

The detailed characteristics of the 15 included studies are presented in Table 3, which summarizes information on the country of implementation, the study population, the research design, the theoretical framework used and the main variables investigated. This table highlights the diversity of rural contexts analysed, as well as the methodological and conceptual variety of the studies included in the review.

Table 3. Centralization of studies included in the domain analysis (n = 15)

No.	Study (authors, year)	Country / Region	Studied population	Study design	Declared theoretical framework		Main variables investigated	Type of evidence proposed	Operationalization of rurality
1	Beck et al., 2019 [20]	USA	Adults from rural communities	Cluster RCT	SDT	(Implicit)	Physical activity, community participation	Implicit SDT-compatible	Nonmetropolitan rural communities; micropolitan/non-micropolitan classification
2	De Man et al., 2020 [21]	Uganda	Adults with (pre)diabetes	Cross-Sectional	SDT	(Explicit)	Motivation, psychological needs, physical literacy	Explicit SDT	Rural districts in eastern Uganda; no numerical threshold reported
3	Jones et al., 2020 [22]	USA	Older adults	Cross-Sectional	SDT	(Explicit)	Exercise motivation	Explicit SDT	Rural county residence; no explicit quantitative criterion
4	Christiana et al., 2014 [23]	USA	Adolescents	Cross-Sectional	Not declared	De-	Physical activity participation, associated factors	Broader PA contextual	Rural county setting; no explicit quantitative criterion
5	Gavarkovs et al., 2017 [24]	Canada	Adults (men)	Descriptive	Not declared	De-	Barriers and facilitators to physical activity	Broader PA contextual	Rural/small-community residence
6	Gendeme h & Khajuria, 2025 [25]	India	School students	Comparative Rural–Urban	Physical Literacy		Physical literacy, health	Direct PL evidence	Rural vs. urban school location; no explicit threshold reported
7	Watkins et al., 2025a [26]	USA	Adolescents	Qualitative (Co-Design)	Media Literacy	SDT	Perceptions, needs, barriers	Implicit SDT-compatible	Rural school/community; no explicit quantitative criterion
8	Hadier et al., 2025 [27]	Pakistan	Children 8–12 years	Cross-Sectional	Physical Literacy		PL level, norms	Direct PL evidence	Rural vs. urban residential locality
9	Mayor-domo-Pinilla et al., 2025 [28]	Spain	Children	Cross-Sectional	Physical Literacy		PL, health-related factors	Direct PL evidence	Rural locality: <20,000 inhabitants
10	Watkins et al., 2025b [29]	USA	Adolescents	Cross-Sectional	Not declared	De-	Physical activity, anxiety, social media	Broader PA contextual	Rural school/community; no explicit quantitative criterion
11	Pelletier et al., 2025 [30]	Canada	Adults	Mixed (BCW)	Behaviour Change Wheel		Barriers / facilitators to physical activity	Broader PA contextual	Remote/small rural/rural communities; <20,000 inhabitants
12	Till et al., 2025 [31]	Germany	Rural communities	Qualitative / Mixed	Not declared	De-	Policies, facilitators to physical activity	Broader PA contextual	Districts classified as “extremely rural”

13	Greeven et al., 2023 [32]	USA	Children and adults	Mixed (Needs Assessment)	SDT (Explicit)	Physical activity, psychological needs	Explicit SDT	Rural community setting; no explicit numerical threshold
14	Chen et al., 2024 [33]	China	adolescents	Cross-Sectional	SDT (Explicit)	PL, interpersonal support, basic psychological needs	Explicit SDT + Direct P	Residential category: city/town/village; village = rural
15	Yin et al., 2023 [34]	China	PE teachers	Interventional	Health Literacy	Competencies, literacy	Direct PL evidence	Rural areas; no explicit operational criterion reported

Note. SDT = Self-Determination Theory; PL = Physical Literacy; RCT = Randomized Controlled Trial; BCW = Behaviour Change Wheel; PE = Physical Education; BCW = Behaviour Change Wheel. “Rural context” indicates that the study was conducted in a rural or predominantly rural setting as defined by the original authors, or that rural-specific results were reported separately in rural–urban comparative designs. Rurality was recorded according to the operational definition used in each original study. Where no explicit population, density, administrative, or geographical criterion was reported, the setting was considered author-defined rural and was not retrospectively reclassified by the review authors. The study by Till et al. [31] focused explicitly on districts classified as “extremely rural.”

The focus highlights a predominance of observational studies and rural North American populations, with variable use of explicit theoretical frameworks. PL is investigated directly, especially in children and adolescents, while SDT is predominantly applied in studies of adults and specific populations. All studies explicitly report conducting research in rural or predominantly rural contexts, justifying their inclusion in the domain analysis.

3.3. Opportunities identified in the reviewed literature

An examination of the content of the included studies indicates that opportunities for promoting physical activity (PA) in rural settings are organized around motivational mechanisms consistent with Self-Determination Theory (SDT) [6]. In most cases, this convergence represents a post hoc interpretation rather than the result of direct empirical testing, as only four of the fifteen studies explicitly applied SDT (see Table 3, type of evidence). Specifically, these opportunities reflect the conditions in which the rural environment can support the satisfaction of fundamental psychological needs for autonomy, competence, and relatedness, facilitating the internalization of active behaviors and the development of PL in the long term.

The identified opportunities were grouped into five major thematic categories: (1) school-level opportunities; (2) community-level opportunities; (3) family and intergenerational opportunities; (4) digital and hybrid opportunities; and (5) local policy and systems opportunities.

3.3.1. The school environment as an opportunity for supporting autonomy and competence

The studies analysed indicate that the rural school environment can function as a privileged context for the development of PL when educational practices support student autonomy and the development of perceived competence [28, 29]. The curricular flexibility, frequently characteristic of rural schools, allows the adaptation of activities to the interests of students and to the locally available resources, favoring experiences of success and voluntary participation.

Studies conducted in rural schools reported associations between structural intervention components, educational support, and the levels of participation in physical activity and physical-literacy-related dimensions [20, 34]. Studies on PL in children have also indicated the potential of school as a primary setting for developing physical skills and active behaviors [27, 28]. Interventions based on co-design and student involvement in planning activities were associated, in this study, with a stronger sense of autonomy and increased active participation, especially in rural schools with limited

resources [26]. One intervention study describing a multi-level school program that combined physical education, a digital component, and community engagement reported favorable changes in motivation and PL-related indicators [34]. In addition, participatory approaches that involved students in the design of interventions were reported as increasing perceived relevance and involvement in program activities in rural contexts [26]. The authors of this study also noted that closer teacher–student relationships appeared, in participants' accounts, to reinforce these dynamics.

These findings may be considered alongside the international literature on physical education based on SDT, which shows that teaching strategies oriented towards autonomy and constructive feedback increase student engagement and perceived competence [35–37]. Five of the fifteen included studies [20, 26, 27, 28, 34] support this theme, covering both observational research and an interventional study. Their methodological typology is presented in Table 1.

3.3.2. Community social capital as an opportunity for relatedness

A distinct element highlighted in the literature analysed is the role of social capital and community cohesion as facilitators of participation in physical activity. Several included studies reported that interventions developed in collaboration with local actors — families, community organizations, and informal leaders — were described by participants or authors as more acceptable and more likely to be sustained over time [20, 30, 31].

In rural environments, the density of social relationships and a sense of belonging can compensate for infrastructural limitations, supporting the need for relationality described by SDT. Participatory programs and co-creation approaches have been identified as opportunities for transforming the community into an active environment that normalizes physical behaviors [32]. The social cohesion specific to rural communities thus appears as a distinct opportunity for creating environments that support relationality and belonging.

Comparable patterns are described in public health research on participatory community interventions in settings with limited formal infrastructure [38–40].

Four of the included studies [20, 30, 31, 32] support this theme, with the majority employing a qualitative or mixed-methods design.

3.3.3. Family and intergenerational environment as an opportunity for internalizing active behaviors

The analyzed literature highlights the central role of the family in transmitting values related to physical activity in rural areas. Parental support and active behavior models have been associated with higher levels of participation in physical activity among children and adolescents [23, 32].

In particular, physical activities carried out jointly between generations have been identified as facilitating factors for the internalization of values related to movement, contributing to the simultaneous satisfaction of competence and relationality needs. In rural communities, where intergenerational interactions are frequent, these mechanisms may have an amplified impact on the development of physical literacy. In the case of adults and the elderly, social support and family context have been associated with motivation for physical activity and the maintenance of active behaviors [22]. Some results have suggested that the close social networks characteristic of rural communities may facilitate participation in physical activities and the adoption of an active lifestyle.

These findings suggest that interventions that capitalize on intergenerational relationships may represent an important opportunity in rural settings. This is broadly in line with international literature indicating that family involvement is among the factors associated with physical activity participation in children and adolescents [41, 42]. Chen et al. (2024) [33] further demonstrated that interpersonal support from peers, parents, and teachers significantly predicted physical literacy levels among rural Chinese

adolescents, with SDT constructs — particularly relatedness and autonomy support — explaining a substantial portion of the variance observed.

3.3.4. Digital and hybrid solutions as opportunities for extending access and autonomy

Much like family-oriented mechanisms, digital and hybrid opportunities represent a theme still in the making, rather than an established area of practice. Among the studies included, these approaches appear in only three of the fifteen works [26, 29, 34], whether as a central element or as indirect mentions.

Some studies have reported the use of digital or hybrid interventions as solutions to overcome resource access limitations in rural settings. Programs combining digital components with face-to-face interventions were described in the included studies as being associated with increased access to information and with participants' self-reported motivation for physical activity [26, 34]. Programs that integrated digital components were associated with health-literacy and active-behavior outcomes, particularly among teachers and students [34]. Among adolescents, one study examined associations between digital media use, physical activity behaviors, and related psychosocial factors [29]. However, the outcomes reported across these studies appeared to vary with the level of technological infrastructure and digital literacy within the population studied.

3.3.5. Multi-level policies as a systemic opportunity

Studies that have approached the rural environment from a systemic perspective have highlighted the importance of aligning local policies, infrastructure and educational resources to support physical-activity participation and, by extension, physical literacy development [20, 31]. Multi-level approaches, integrating interventions at the individual, school, and community levels, were reported across several included studies, in contrast to approaches targeting a single level in isolation. The authors of these studies suggested that such approaches might address autonomy, competence, and relatedness simultaneously, although this inference was not directly tested within the included studies.

In addition, comparative rural–urban studies have highlighted the need to adapt interventions to the characteristics of the rural context, suggesting that strategies developed for the urban environment cannot be directly transferred [24, 25].

Based on the identified themes, this scoping review allowed the outline of a descriptive conceptual model in which opportunities for promoting PL in rural areas are organized on interconnected levels: school, family, community and systemic. The included studies reported associations between these opportunities, participation in physical activities, and dimensions of physical literacy [21, 22, 32], as well as between these opportunities and general factors that facilitate or, conversely, limit physical activity [30], described in relation to motivational mechanisms and social support. Three of the included studies directly address this topic [20, 24, 25, 31], yet the statements made at the public policy level remain largely inferential, lacking support from dedicated empirical testing.

Overall, the results indicate that the rural environment can function not only as a context of risk for physical inactivity, but also as a space with high potential for the development of PL when its specific motivational and relational mechanisms are harnessed. The identified opportunities converge around conditions related to contextual adaptation, participatory design, and theoretical grounding in SDT principles, which future intervention studies could further examine.

4. Discussion

The aim of this scoping review was to identify and map opportunities for promoting PL in rural settings through the lens of SDT. The findings highlight the existence of a heterogeneous body of literature, still in a developmental stage, which provides

valuable insights into mechanisms and contexts conducive to the development of physical literacy, but also reveals significant gaps regarding theoretical grounding and intervention evaluation.

This heterogeneity reflects both the diversity of rural contexts analysed and the absence of unified conceptual frameworks to guide intervention design and outcome assessment, a point also noted in international literature on promoting physical activity in disadvantaged settings [44, 45].

Overall, the analysed literature suggests that rural environments should not be viewed solely as resource-deficient contexts but as distinct settings with specific socio-ecological characteristics that can either facilitate or inhibit the development of PL depending on how they are leveraged. Integrating the perspective of SDT provides a useful explanatory framework for understanding how these characteristics influence motivation for physical activity and the long-term development of physical literacy.

From a socio-ecological perspective, individual, social, and environmental factors interact dynamically in shaping active behaviors, and rural environments may offer both structural constraints and relational opportunities that are less present in urban settings [46].

4.1. Interpreting identified opportunities through the lens of SDT

One of the main findings of this review is that opportunities for promoting PL in rural areas are closely linked to the satisfaction of the basic psychological needs described by SDT: autonomy, competence, and relatedness [6]. The included studies suggest that interventions and practices supporting these needs have the potential to foster the development of autonomous motivation and sustained engagement in physical activity [1]. This interpretation is empirically supported by SDT in only four of the fifteen studies analyzed; in the remaining cases, the SDT perspective was applied post hoc to constructs originally formulated in different terms, meaning that the conclusions in this section lack empirical support and are predominantly interpretive in nature.

This finding aligns with empirical evidence indicating that autonomous motivation is one of the strongest predictors of sustained participation in physical activity and the adoption of a long-term active lifestyle [47].

At the school level, educational practices that provide students with opportunities for choice, constructive feedback, and success experiences tailored to individual levels appear particularly relevant in rural contexts [2, 7]. In these settings, curricular flexibility and close teacher–student relationships can create conditions favorable for supporting autonomy and competence, thereby contributing to the development of PL [4]. However, the lack of systematic use of the SDT framework in designing and evaluating school interventions limits the ability to fully understand the motivational mechanisms involved.

Furthermore, research in physical education shows that autonomy-supportive teaching strategies are associated with higher levels of engagement, satisfaction, and persistence in physical activity compared with controlling approaches [37].

At the community level, findings highlight the role of social capital and community cohesion as facilitators of relatedness, one of the basic psychological needs. Initiatives based on local stakeholder involvement and co-creation of physical activity programs appear particularly suitable for rural settings, where social networks are often more tightly interconnected [32]. These findings suggest that interventions leveraging existing community relationships may be more contextually relevant than standardized approaches imported from urban settings, although this comparison was not directly tested within the included studies. Related patterns have also been reported in research beyond the studies included in this scoping review [48, 49].

The role of social capital in facilitating health behaviors is well documented, being associated with increased participation in physical activity and supporting community-based interventions, especially in rural areas where interpersonal relationships are denser [50].

4.2. Role of family and the intergenerational environment

The findings of this review highlight the importance of the family as a key environment for the development of PL in rural settings. Parental support, active behavior modeling, and shared physical activities contribute to the internalization of movement-related values and the formation of autonomous motivation. From an SDT perspective, these interactions can simultaneously support autonomy (through encouragement and support), competence (through feedback and guided experiences), and relatedness (through shared activities). Greeven et al. (2023) [32], in a multi-level needs assessment conducted in rural communities in the USA, identified family support as one of the factors influencing the satisfaction of basic psychological needs and physical activity levels in both children and adults. Within this review, family-related mechanisms were addressed directly by only two included studies [23, 32], both describing associations rather than tested interventions.

These findings are consistent with literature on the influence of the family environment on physical activity behaviors, which indicates that parental involvement is one of the strongest predictors of children's and adolescents' participation in physical activities, through mechanisms of behavioral modeling and logistical support [41].

The intergenerational nature of rural communities can amplify these mechanisms, providing opportunities for the transmission of norms and values related to physical activity across generations. However, existing literature rarely addresses these dynamics explicitly, and few studies evaluate interventions that deliberately include the family as a central actor in promoting physical literacy. Christiana et al. (2014) [23] reported that parental support played an important role in encouraging rural youth to engage in outdoor recreational physical activities, suggesting that the family can be an influential factor in shaping an active lifestyle in these communities.

In rural settings, where family and community relationships are often closer and more stable than in urban environments, these influences can have an amplified impact on the development of active behaviors and physical literacy, facilitating the intergenerational transmission of movement- and health-related norms [51].

Furthermore, the SDT perspective suggests that the family can function as a primary context for satisfying basic psychological needs, contributing to the internalization of physical activity values and behaviors from childhood, with potential effects on participation throughout life.

4.3. Opportunities and challenges of digital interventions in rural settings

The use of digital and hybrid solutions emerges in the reviewed literature as an emerging opportunity to overcome resource access limitations in rural areas. Digital interventions can facilitate access to information, support self-monitoring, and help maintain motivation for physical activity. Recent literature highlights additional relevant contributions, such as the study by Manskow et al. (2024) [52], which complements and extends the perspectives identified here, showing that adoption and sustained use of digital interventions to promote physical activity critically depend on perceived acceptability and integration into users' daily routines—factors that can vary significantly according to the rural socio-cultural context. However, existing evidence is still limited, and the outcomes reported for these interventions appeared to vary with the available technological infrastructure and the digital literacy level of the target populations.

These constraints reflect the persistent digital divide between urban and rural areas, which affects access to technology, digital skills, and resource availability, thereby limiting the potential of digital interventions to reach the most vulnerable populations [53].

From a SDT perspective, digital solutions can support autonomy and competence but risk undermining relatedness if not integrated into a broader social framework. Therefore, the literature suggests the need for hybrid approaches that combine digital components with face-to-face interaction and community support.

In this regard, external literature suggests that interventions integrating social support and personalized feedback may support autonomous motivation more consistently than purely digital approaches, by addressing autonomy, competence, and relatedness simultaneously [54]. Similarly, studies on mobile applications for physical activity suggest that outcomes tend to be more favorable when digital tools are integrated into structured programs supported by professionals or the community, positioning technology as a complementary tool rather than a substitute for social interaction [43].

4.4. Implications for public policy and practice

The findings of this review indicate that promoting PL in rural settings requires a multi-level approach. The results of the analysis suggest that promoting functional literacy in rural areas requires a multilevel approach that integrates interventions at the individual, school, family, community, and institutional levels [20]. Public policies focused solely on infrastructure or physical access to sports facilities are insufficient without strategies that support autonomous motivation and competence development.

This is consistent with socio-ecological models of physical activity behavior, which propose that interventions acting simultaneously on individual, social, and environmental factors are more likely to produce sustainable change [44].

Integrating SDT principles into educational and public health policies could help design interventions that are more sensitive to rural contexts. Moreover, intersectoral collaboration between education, health, local administration, and community organizations appears essential for the development of sustainable initiatives. Policies aimed at creating environments that foster autonomy and active participation can facilitate the internalization of behaviors related to physical activity. However, the fact that only a single randomized study (whether individual or cluster-based) was identified within the body of evidence analyzed limits this synthesis's ability to determine whether such strategies reduce health inequalities between urban and rural areas or lead to sustained behavioral change [46]. Consequently, while the analysis may point to promising policy directions, it cannot confirm their causal effects. Similarly, Pelletier et al. (2025) [30] identify specific intervention functions for rural communities – such as education, skill development, and environmental restructuring – that can guide local authorities and policymakers in designing programs adapted to rural contexts. Till et al. (2025) [31] also reported that the sustainability of physical activity promotion initiatives was closely associated, in their sample, with the active involvement of local community leaders and the allocation of dedicated municipal resources in extremely rural districts – a pattern the authors suggest should be reflected in public health and physical education policies.

These findings suggest that interventions in rural settings may benefit from a participatory and contextualized approach, in which the local community is involved not only as a beneficiary but also as an active partner in policy design and implementation – a hypothesis consistent with, though not directly tested by, the included studies.

4.5. Gaps in the existing literature and directions for future research

This scoping review highlights several important gaps in the current literature. First, there is a limited number of rigorous intervention studies, particularly experimental or quasi-experimental designs, conducted in rural settings. Second, the explicit and systematic use of SDT is relatively scarce, limiting the ability to compare results and identify the underlying motivational mechanisms.

The lack of controlled interventions makes it difficult to evaluate the effectiveness of strategies to promote PL and physical activity in rural contexts, where environmental and socio-cultural factors can significantly influence outcomes [55]. Furthermore, most studies use cross-sectional designs, restricting inferences about causal relationships and the evolution of PL over time [3, 12]. Future research should emphasize long-term evaluation, the diversity of rural contexts, and the inclusion of underrepresented populations, such as older adults or rural communities from less-studied regions.

Longitudinal studies are essential to understand how PL develops across the lifespan and to identify factors that support the maintenance of active behaviors over time, aspects that remain insufficiently explored in rural environments [56].

Additionally, future research should systematically explore the diversity of rural contexts, as socio-economic, cultural, and geographic characteristics can vary considerably across regions, influencing access to physical activity opportunities and the relevance of standardized interventions. The integration of mixed methods and participatory approaches could provide a deeper understanding of the specific needs and barriers of rural communities, facilitating the development of contextualized and sustainable interventions.

4.6. Strengths and limitations of the scoping review

Among the strengths of this review are the use of a rigorous PRISMA-ScR methodology, the integration of a well-established theoretical framework, and the focus on an underexplored context. Additionally, the scoping review approach allowed for the systematic mapping of an emerging field and the identification of gaps in the existing literature, which is essential when evidence is fragmented and heterogeneous [13].

However, the findings should be interpreted in light of certain limitations, such as the inclusion of English-language studies only and the methodological heterogeneity of the analysed studies, which prevented a quantitative synthesis. This heterogeneity reflects the diversity of study designs and populations investigated—a common feature of scoping reviews—but it limits comparability of results and generalizability of conclusions.

A further limitation concerns the relatively small number of included studies ($n = 15$), which reflects the genuinely nascent state of research at the intersection of physical literacy, SDT, and rural contexts, rather than a methodological gap in the search strategy. The heterogeneity of study designs, populations, and geographic contexts — while consistent with the exploratory nature of scoping reviews — limits the ability to draw generalizable conclusions and prevents the identification of effect patterns across studies. The findings presented in this review should therefore be interpreted as a conceptual map of existing evidence rather than as an established body of knowledge. This heterogeneity is itself a finding of the review, signaling the need for more theoretically grounded and methodologically rigorous research in this area.

Although the MMAT assessment (Table 1) highlighted the strengths and limitations associated with the design of each included study, the analysis was primarily descriptive in nature and did not lead to a systematic adjustment of the confidence level assigned to each thematic category in Section 3.3. To ensure a more transparent interpretation of the evidence, we note that the theme regarding school level (3.3.1) is supported by a cluster-randomized controlled trial (cluster-RCT), alongside several cross-sectional and qualitative studies. This combination offers greater methodological diversity and provides more robust support for the findings than is the case for themes based exclusively on observational data.

The themes concerning community (3.3.2) and policies (3.3.5) rely primarily on qualitative evidence and mixed-methods studies. These contribute to an understanding of the context and the mechanisms perceived by participants but do not allow for the establishment of causal relationships. For the themes regarding family (3.3.3) and the digital/hybrid environment (3.3.4), the evidence stems almost exclusively from cross-sectional or descriptive studies. Consequently, conclusions regarding the effectiveness of the interventions or factors analyzed must be interpreted with a lower level of confidence.

This distinction does not alter the exploratory nature of the scoping review but rather provides a more transparent framework for interpreting the results. In this regard, some conclusions are more strongly supported by evidence from interventional or mixed-methods studies, whereas others rely predominantly on descriptive and cross-sectional data, thus warranting more cautious conclusions.

Another important limitation is the pronounced geographic concentration of the included studies, with a predominance of North American contexts (46.7% of included studies originate from the USA and Canada), making it more difficult to apply the results to other cultural or socio-economic contexts. This uneven distribution highlights the need to expand research on PL in rural contexts in other regions of the world, where socio-economic conditions and infrastructure may differ substantially. In particular, the absence of studies addressing Eastern Europe represents a significant gap, considering that this region exhibits rural characteristics distinct from North America: rural communities with specific sporting and motor traditions, educational infrastructure undergoing reform, and large socio-economic disparities between urban and rural areas. These particularities suggest that direct transfer of interventions developed elsewhere may be limited, and culturally and structurally adapted programs are needed. There was no common framework for classifying rural areas across the included studies. The authors of each paper employed their own definitions of rurality, resulting in varied operationalizations—ranging from thresholds based on population density to subjective assessments of isolation. Consequently, direct comparability between studies is limited, and the transferability of the identified opportunities to other rural contexts remains restricted.

For studies where the full text was unavailable, no attempt was made to obtain the materials via interlibrary loan or by directly contacting the authors. This operational exclusion criterion represents a limitation of the search and selection process and may have introduced selection bias, as accessibility is independent of scientific relevance. Furthermore, the exclusion of publications not written in English may result in the loss of relevant regional contributions, particularly from Eastern Europe, Latin America, and certain regions of Asia.

Overall, this scoping review highlights the potential of rural environments to support the development of PL when interventions are designed in alignment with SDT principles and adapted to the local context. These findings provide a foundation for practical and policy-oriented recommendations and underscore the need for future research integrating interdisciplinary perspectives and exploring the diversity of rural contexts globally.

5. Conclusions

This scoping review highlighted that PL is a relevant and applicable construct for promoting an active lifestyle in rural settings, and that SDT provides a coherent explanatory framework for understanding the underlying motivational mechanisms. The reviewed literature suggests that opportunities to develop PL in rural communities are closely linked to how educational, family, and community environments support the satisfaction of the basic psychological needs of autonomy, competence, and relatedness. Thus, the development of PL in rural contexts appears to be a multidimensional process, dependent on the interaction of individual, social, and environmental factors.

The findings indicate that rural settings should not be approached solely through the lens of resource limitations but as distinct contexts with inherent potential to support autonomous motivation and long-term engagement in physical activity. Context-sensitive educational practices, community involvement, family support, and participatory initiatives emerge as key opportunities for promoting physical literacy, especially when integrated within a multi-level approach. This perspective underscores the importance of leveraging local resources and the social capital specific to rural communities.

However, the review also identifies significant gaps in the existing literature, particularly regarding the explicit and systematic use of SDT, the limited number of rigorous intervention studies, and the narrow diversity of rural contexts examined. These limitations constrain the ability to draw generalizable conclusions and highlight the need for future research that combines methodological rigor with sensitivity to local

context. Developing culturally adapted, longitudinally evaluated interventions represents a priority direction for future research.

Overall, the analysis suggests that promoting physical literacy (PL) in rural areas requires interventions that are context-specific, theoretically grounded, and aimed at fostering autonomous motivation. Given that most of the evidence stems from observational studies—with only a single randomized trial (individual or cluster-based) included—integrating Self-Determination Theory (SDT) principles into education, public health, and local policy should be viewed as a promising, hypothesis-generating direction rather than a fully validated strategy for reducing urban-rural health disparities. Validating this potential will require SDT-based interventions specifically designed to test whether policies grounded in this theory yield measurable and sustainable reductions in rural-urban inequalities.

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