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## **A New Breakthrough Urgently Requiring Localization: Thirty Years of Physical Literacy Research—Review and Prospect**

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### **Abstract**

Physical Literacy (PL) refers to the comprehensive capabilities required to maintain physical activity throughout the lifespan, constituting a lifelong physical activity process. Over the past decade, Physical Literacy research has emerged as a prominent frontier issue in the field of sports science worldwide; Western countries, particularly Canada, have been at the forefront of international research on the assessment and application of Physical Literacy. This study systematically reviewed and logically analyzed relevant research literature on Physical Literacy from the past three decades, conducting in-depth exploration from the perspectives of conceptual historical evolution, dimensional analysis of structural attributes, systematic comparison of operational measurements, and evaluation and application. By comparing domestic and international research progress, it proposes that an assessment and application system for Physical Literacy should be developed in accordance with national conditions and traditional national cognition, and on this basis, provides an outlook on potential future research directions in Physical Literacy.

### **Full Text**

## **A New Breakthrough Urgently Needed in Localization: Thirty Years of Physical Literacy Research—Review and Prospect**

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## Abstract

Physical Literacy (PL) refers to the comprehensive ability required to maintain physical activity throughout the lifespan, representing a lifelong physical education process. In recent decades, research on physical literacy has become a cutting-edge topic in sports science worldwide. Western countries, particularly Canada, have taken the lead in the evaluation and application of physical literacy. This study systematically reviews and logically analyzes relevant literature on physical literacy from the past three decades, exploring in depth the historical evolution of the concept, dimensional analysis of structural attributes, systematic comparison of operational measurements, and evaluation and application. By comparing research progress domestically and internationally, this paper proposes that an evaluation and application system for physical literacy should be developed in accordance with national conditions and traditional cognitive frameworks, and on this basis, prospects potential future research directions in physical literacy.

**Keywords:** Physical literacy; concept evolution; structural attributes; operational definition; evaluation

Physical Literacy (PL), also translated as “body literacy” in China [9], refers to the comprehensive ability required to maintain physical activity throughout the lifespan, representing a lifelong physical education process [2,3]. The International Physical Literacy Association (IPLA) defines physical literacy as: the motivation, confidence, physical competence, knowledge, and understanding to value and take responsibility for engaging in physical activities for life (<https://www.physical-literacy.org.uk/>). While many scholars in physical education consider the term “physical literacy” relatively new, McCloy (1957) actually discussed its meaning as early as the mid-20th century, though without proposing a rigorous definition at that time [48]. In China, Xia Feng (1990) first introduced the concept of physical literacy, interpreting it within an extremely broad cultural attribute framework equivalent to sports culture [11]. Additionally, the UK Sports Councils first proposed the concept in 1991 and conducted preliminary cultural discussions [62]. It was not until the 21st century, as physical literacy transitioned from a sports culture term to a physical education term, that renewed interest emerged in this concept within new contexts.

In recent decades, physical literacy research has become a hot frontier issue in sports science worldwide. Scholars at home and abroad have conducted in-depth studies on its conceptual connotation, structural attributes, operational measurement, and evaluation and application. In 2015, the *Journal of Sport and Health Science* published nine consecutive papers discussing physical literacy research [22,24,29,43,44,51,53,55,58]. In October 2018, *BMC Public Health* published a special issue featuring 14 research articles on physical literacy and the Canadian Assessment of Physical Literacy (CAPL) [21,26,33,34,38,39,40,42,45,49,50,54,59,60]. Spanning 2014 to 2017, over 10,000 children aged 8-12 from 11 cities across Canada participated in this research

through the Children's Hospital of Eastern Ontario (CHEO) Research Institute. Using CAPL, researchers evaluated children's physical literacy across many domains, including relationships between sedentary behavior, daily activity, and physical literacy. Results indicated that physical educators need to do more to promote physical literacy among Canadian children and adolescents. With rising childhood obesity rates, declining physical activity levels, and increased screen time, changes are urgently needed. Physical literacy addresses multiple domains of children's development, providing a more comprehensive understanding of positive lifestyle habits and future health consciousness to benefit them throughout life.

### 1.1 Three Interpretations of Physical Literacy Concept in China

The concept of physical literacy is complex and rich in connotation, forming three distinct interpretations within China. First, the **Cultural Theory** represents an early interpretation. Xia Feng (1990), who first proposed the concept, considered physical literacy essentially equivalent to sports culture level [11]. Li Yingxin (1995) similarly viewed it as specifically referring to sports culture level [7], and Professor Lai Tiande (1998) concurred [6]. However, around the turn of the century, with national attention to quality education, scholars' understanding expanded beyond sports culture level toward what became known as the **Quality Theory**. Wang Yonghui (1999) defined physical literacy as a sports quality formed by combining innate natural factors (physiological aspects) with acquired social factors (spiritual aspects) and sports abilities developed through environment and physical education [10]. Yu Zhi (2005), analyzing previous concepts and considering the intrinsic requirements of quality education, proposed that physical literacy represents comprehensive sports quality and cultivation developed through postnatal environment and physical education based on innate hereditary qualities [16]. Unlike the Cultural Theory, the Quality Theory explicitly incorporates "physical constitution" elements. As understanding deepened, scholars increasingly recognized that physical literacy should be a comprehensive concept encompassing various elements, leading to the **Comprehensive Theory**. Feng Gushou et al. (1999) viewed it as the synthesis of various sports spiritual elements and their qualities [4]. Yu Xiu et al. (2012) defined it as fundamental sports elements resulting from education during schooling that significantly influence lifelong sports participation, representing comprehensive cultivation ensuring students' lifelong benefits from sports [14]. Yang Xiannan et al. (2015) described it as a comprehensive cultural shaping of body culture and spiritual culture gradually formed in practice through family, school sports education, and social environment based on innate hereditary qualities [12]. Ma Yong et al. (2016) considered it a comprehensive cultural level gradually formed throughout life during the process of using body movement to promote physical and mental development based on innate heredity and postnatal environmental influences [8]. Yu Yonghui et al. (2017) proposed that physical literacy represents the disciplinary and concrete manifestation of core competency de-

velopment, a comprehensive quality formed postnatally based on innate heredity through sports and fitness processes [15].

## 1.2 Interpretations by Institutions Worldwide

The Society of Health and Physical Educators (SHAPE), founded in 1885, is the largest professional organization for health and physical education in the United States ([www.shapeamerica.org](http://www.shapeamerica.org)). SHAPE America (2014) adopted Mandigo et al.'s (2012) definition in its *National Standards & Grade-level Outcomes for K-12 Physical Education* (2014) [47]. They define physical literacy as the ability and confidence to participate in a variety of physical activities in diverse environments that benefit whole-person development. The goal of physical education is to cultivate physically literate individuals who possess the knowledge, skills, and confidence to enjoy lifelong healthy physical activity. As individuals pursuing lifelong health through physical activity, a physically literate person should have: skills necessary to learn and participate in various sports activities; understanding of the meaning and benefits of participating in various sports activities; regular participation in physical activities; physical fitness; and appreciation for physical activity and its contribution to a healthy lifestyle.

SHAPE lists five national standards for physical education [46]: (1) Physically literate individuals demonstrate competency in a variety of motor skills and movement patterns. (2) They apply knowledge of concepts, principles, strategies, and tactics related to movement and performance. (3) They demonstrate knowledge and skills to achieve and maintain a health-enhancing level of physical activity and fitness. (4) They exhibit responsible personal and social behavior that respects self and others. (5) They recognize the value of physical activity for health, enjoyment, challenge, self-expression, and/or social interaction. However, SHAPE emphasizes motor skills and confidence while neglecting psychosocial factors affecting physical literacy development, treating it as a state rather than a process, focusing on physical activity without addressing how to exercise healthily.

The Pacific Institute for Sport Excellence (PISE), established in 2008 in Vancouver, Canada, is Canada's first summer sports academy (<http://www.pise.ca/>). PISE aims to transform lives through healthy activity and sport, providing physical activity and health education programming for children, youth, and adults. They emphasize movement skills and perceptual aspects of "reading" the movement environment, acknowledging confident personality traits but mentioning few other psychosocial factors. They treat physical literacy as a present-or-absent state without addressing its developmental process or healthy exercise approaches [20].

The New South Wales Department of Education (Australia) endorses Whitehead's 2006 definition (<https://education.nsw.gov.au/>) [66]: physical literacy encompasses "motivation, confidence, physical competence, and knowledge and understanding to maintain physical activity at an

appropriate level throughout the life course.” The Australian Sports Commission defines it as mastering fundamental movement and sports skills ([https://www.sportaus.gov.au/physical\\_literacy](https://www.sportaus.gov.au/physical_literacy)) that enable children to “read” their surroundings and make appropriate movement decisions, allowing confident, controlled movement in diverse physical activities. They divide physical literacy into four components: physical (skills and fitness), psychological (attitudes and emotions motivating active participation), social (social skills and interaction), and cognitive (knowing how, why, and when to move). The Australian interpretation uniquely adds a social interaction dimension absent in other definitions [37].

Sport New Zealand (<https://sportnz.org.nz/>) integrated and interpreted physical literacy in 2015, arguing it should comprehensively address participants’ physical, social-emotional, cognitive, and spiritual needs—adding physical, social-emotional, cognitive, and spiritual dimensions compared to the IPLA version [57].

Sport Wales, the national organization responsible for developing and promoting sport in Wales (<http://sport.wales/>), collaborates with sports governing bodies and local authorities to encourage youth participation. They define physical literacy as possessing a range of technical skills, confidence, and motivation to participate in various sports and physical activities at every life stage. This empowers individuals to exercise in their preferred way, eliminating the fear of “getting out there” or lack of motivation many experience. Four personal factors contribute to physical literacy: specifically, physical skills + confidence + motivation + many opportunities = physical literacy. However, they still emphasize skills, confidence, and motivation as empowering factors, consider opportunities important, and focus on physical activity without addressing healthy exercise approaches [61].

Physical & Health Education Canada (PHEC) ([www.phecanada.ca/](http://www.phecanada.ca/)) defines physical literacy as the ability to move with poise and confidence in various activities, including capacities related to whole-person development (physical, emotional, cognitive). Their definition encompasses psychosocial importance such as motivation, social responsibility, self-esteem, and culture. Physically literate individuals develop motivation and capacity to understand, communicate, apply, and analyze different movement forms. They demonstrate confidence, competence, creativity, and strategy across a wide range of health-related physical activities, enabling healthy, active choices benefiting themselves, others, and their environment. However, this still emphasizes physical literacy as a state rather than a process, focusing on physical activity rather than healthy exercise approaches [46].

In 2016, PHEC further revised their definition: physical literacy includes moving with competence and confidence in a variety of physical activities in diverse environments that benefit whole-person development. Physical literacy influences many life areas—for example, competent movers often achieve greater academic and social success. They understand how to live actively and can transfer

abilities across domains. Physically literate individuals possess the skills and confidence to move as they wish, demonstrate these across various activities and environments, and use them to make themselves and others active and healthy [30].

In 2018, PHEC reaffirmed physical literacy's significance, stating it provides children and youth with a solid foundation of skills, knowledge, and attitudes needed to move with poise and confidence in various activities. Physical literacy development has become educators' and practitioners' creed, with many provincial curricula now identifying it as a primary physical education objective. Again, this emphasizes physical literacy as a state rather than a process, focusing on physical activity rather than healthy exercise approaches [31].

### 1.3 Progressive Interpretation by the International Physical Literacy Association

The first International Physical Literacy Conference was held at the University of Bedfordshire in 2008, followed by seminars at Loughborough, Plymouth, Canterbury, and Derbyshire. At Canterbury, the conference proposed that physical literacy should include personality psychological characteristics such as self-esteem and confidence. At Plymouth, it emphasized physical literacy development as a journey through life, highlighting lifelong cultivation. At Derbyshire, participants proposed a progressive physical literacy system, while at Loughborough, they emphasized its practical significance. The second conference in 2011 at the University of Bedfordshire focused on physical literacy in preschool and primary education. The third international symposium in 2013 at Wyboston Lakes, Bedfordshire, specifically addressed physical literacy in secondary education and discussed IPLA establishment issues (<https://www.physical-literacy.org.uk/>). The fourth IPLA international symposium was held June 26-28, 2018, in Cardiff, Wales, with the theme "Physical Literacy—Coaching, Community, and Education." The conference aimed to: gather international speakers, researchers, practitioners, policymakers, and managers to share knowledge and experience through keynote speeches, workshops, paper presentations, and practical sessions; celebrate physical literacy's impact on individuals and communities (local and global); challenge, inspire, and support practitioners to provide accessible opportunities for developing physical literacy; provide platforms for sharing ideas and resources; promote physical literacy's value worldwide; and continue developing the concept through comprehensive exchange platforms.

The IPLA, adhering to Whitehead's philosophy, describes physical literacy as motivation, confidence, physical competence, knowledge, and understanding to value and take responsibility for lifelong physical activity [63]. In their 2017 revised concept, physical literacy is described as motivation, confidence, physical competence, knowledge, and understanding for lifelong physical activity. To be active, individuals need their affective, cognitive, and physical domains—they require motivation, confidence, and competence. These interwoven, inter-

dependent elements constitute the blend that is physical literacy. This blend represents an interactive, progressive lifelong physical activity process. If one or more elements are lacking or lag behind others (or if we focus only on one aspect), physical activity capacity suffers and physical literacy development is delayed or stagnates.

#### 1.4 Whitehead' s Historical Evolution of Physical Literacy Concept

British scholar Margaret Whitehead, a leading authority on physical literacy, has refined her understanding over time. In 2001, she first defined physical literacy as: “the ability to move with poise, economy, and confidence in a wide variety of physically challenging situations [62]. Furthermore, the individual is perceptive in ‘reading’ all aspects of the physical environment, anticipating movement needs or possibilities, and responding appropriately with intelligence and imagination.”

In 2005, Whitehead revised the concept: “Physical literacy can be described as the motivation, confidence, physical competence, knowledge, and understanding to maintain physical activity at an appropriate level throughout life [36].” She proposed four characteristics: (1) Physical literacy can be described as the ability and motivation to use our movement potential to make significant contributions to quality of life. As humans, we all demonstrate this potential, though its specific expression is particularly important to our life culture and movement capabilities; (2) Physically literate individuals maintain balance, economical movement, and confidence in various challenging situations; (3) They possess a well-developed sense of self in the world, interacting clearly with the environment to generate positive self-esteem and confidence, with sensitivity to embodied abilities enabling nonverbal communication and empathetic interaction leading to fluent self-expression; (4) They can identify and articulate essential factors affecting their movement performance effectiveness and understand health principles regarding exercise, sleep, and nutrition.

In 2013, Whitehead defined physical literacy as: “the motivation, confidence, physical competence, knowledge, and understanding to maintain meaningful physical activity throughout the life course [65].” She expanded the characteristics to six: (1) Motivation and confidence to fully utilize innate movement/physical potential to contribute significantly to quality of life, with expression depending on personal endowment, movement potential, and particularly cultural background; (2) Maintaining balance, economical movement, and confidence in challenging situations; (3) Sensitive movement perception, “reading” physical environment aspects, anticipating movement needs, and responding appropriately with intelligence; (4) A well-developed sense of self in the world, generating positive self-esteem and confidence through clear environmental interaction; (5) Sensitivity and awareness of embodied abilities enabling nonverbal communication and empathetic interaction for fluent self-expression; (6) Capacity to identify and articulate factors affecting movement performance effective-

ness and understand health principles regarding exercise, sleep, and nutrition.

Whitehead' s evolution shows physical literacy progressing from movement and states to psychology and lifelong processes, emphasizing postnatal environmental shaping. It develops from self-perception to effective environmental interaction, then to nonverbal fluent self-expression—constituting a dynamic, evolutionary, continuously self-correcting conceptual system.

The IPLA (<https://www.physical-literacy.org.uk/>), referencing Whitehead' s 2013 definition, defined physical literacy in 2017 as: “the motivation, confidence, physical competence, knowledge, and understanding to value and take responsibility for engaging in physical activities for life [65].” While other scholars have proposed alternative definitions—such as UK Sport (2002): developing agility, balance, coordination, and skills across broad activities [36]; Higgs et al. (2008): developing fundamental movement skills enabling confident, controlled movement [35]; Delaney & Donnelly (2008): applying body management and object control skills competently and confidently [25]; Mandigo et al. (2009): capacities for whole-person development through various physical activities [46]; Couturier et al. (2014): knowledge, skills, and confidence for lifelong healthy physical activity [23]—the international community largely endorses the IPLA definition [52].

## 2.1 Domestic Interpretations of Structural Attributes

The complex concept and rich connotation of physical literacy determine that its structure and attributes encompass numerous comprehensive factors, including culture, quality, ability, knowledge, and skills.

Table 1 lists domestic classifications of physical literacy structural attributes. The number of dimensions ranges from five to seven. Among these, sports consciousness, sports knowledge, sports skills, and physical constitution level are considered by Chinese scholars as most appropriately reflecting physical literacy' s structure and attributes. Other structures show considerable divergence, reflecting controversy over core connotations and uncertainty about attribute characteristics.

## 2.2 International Overview of Structural Attributes

Edwards et al. (2017) reviewed 50 English-language papers on physical literacy [27], categorizing attributes by frequency. The **affective** dimension included: confidence (26 papers), motivation (23 papers), and self-esteem (4 papers). Individuals lacking confidence, motivation, or self-esteem show lower participation willingness.

The **cognitive** dimension included: knowledge and understanding of activities (16 papers), knowledge of healthy and active lifestyles (13 papers), and valuing and taking responsibility for physical activity (2 papers).

The **physical capabilities** dimension included: movement capacities (22 papers), motor skill competence (18 papers), physical competence (12 papers), fundamental movement skills (8 papers), and purposeful physical pursuits (6 papers).

Developmental pathways were categorized as: throughout the lifespan (19 papers), unique journey (7 papers), and Long-Term Athlete Development model (5 papers).

Target audiences included: children (13 papers), all can develop physical literacy (3 papers), and importance for adults (3 papers).

Overall structural attributes included: reading/interacting with environment (14 papers) and movement with poise and economy (5 papers).

Edwards et al.'s review shows international research focuses more on psychological and cognitive attributes, emphasizing confidence and motivation's importance. Movement capacity and motor perception hold significant positions, with most research targeting children and adolescents and emphasizing lifelong development. Environmental interaction receives considerable attention.

### 3.1 Domestic Operational Definitions of Physical Literacy

Following conceptual and structural exploration, the next research step involves operational definition and measurement. Domestic research has focused mainly on conceptual analysis and structural debate, with few studies addressing operational definitions and measurement. Chen Qi (2002) first operationalized one attribute, defining sports knowledge and skills as: learning basic sports knowledge, techniques, and skills, emphasizing mastery of fitness knowledge and methods; proficiently mastering 3-4 sustainable lifelong sports based on broad skill learning [1]. Yu Xiu (2013) studied operational definitions and measurement, defining sports knowledge as Olympic knowledge and fitness common sense [13]. Jiao Jie (2015) operationalized sports knowledge as: human body knowledge (anatomy, physiology, hygiene), sports health care knowledge (first aid, protection, nutrition), and sports knowledge (understanding of sports events and basic methods) [5]. Ma Yong (2016) defined it as: understanding of health, hygiene common sense, and safe exercise knowledge [8]. These four studies' operational definitions of other structures also differ significantly. Measurement methods, except for physical constitution using instrument testing, all employ self-report questionnaires, using either Likert scales or multiple-choice/true-false formats.

### 3.2 International Measurement Methods for Physical Literacy

The complexity and multidimensionality of physical literacy concepts and structural attributes necessitate comprehensive measurement considerations. International approaches include both qualitative and quantitative methods [28]. **Qualitative methods** include: (1) Interviews with primary, secondary, and

university students and nursing home retirees about comprehensive perceptions of physical education and intervention effects; (2) Open-ended questionnaires on students' attitudes, perspectives, and knowledge about physical education and teachers' willingness to apply physical literacy; (3) Reflective diaries on teachers' perceptions of physical education effectiveness and students' personal activity goal-setting; (4) Focus groups on physical education's role in physical literacy from children's perspectives, retirees' understanding, and teachers' cognition; (5) Participant observation of children's outdoor environment interaction and retirees' social interaction; (6) Visual methods including video recording analysis and photo elicitation.

**Quantitative methods and instruments** include: (1) **Physical domain:** Accelerometer, International Physical Activity Questionnaire, pedometer, postural tests, 20-m multi-stage fitness test, Bruininks-Oseretsky Test of Motor Proficiency, Functional Movement Screen (FMS), Henderson and Sugden's Movement Assessment Battery for Children, agility test, Nutrition and Physical Activity Self-Assessment of Child Care, performance diary, Physical Activity Questionnaire for Older Children, straight sprint test, Taco Bell Challenge, Test of Gross Motor Development, Canadian Agility and Movement Skills Assessment, and vertical jump. (2) **Affective domain:** Brustad's Children's Attraction to Physical Activity Scale, Children's Physical Activity Self-Efficacy Scale, Children's Self-Perception of Adequacy in and Predilection for Physical Activity Scale, Global Physical Self-Worth subscale of the Child and Youth Physical Self-Perception Profile, Harter's Self-Perception Profile for Children, Intrinsic Motivation Inventory, and Physical Ability subscale of the Self-Description Questionnaire. (3) **Cognitive domain:** Creative thinking test, mock exam paper, non-validated cognitive questionnaire, optional creative writing assignments, and Understanding Physical Literacy questionnaire.

Compared with domestic approaches, international operational definitions are more micro-level and detailed, with measurement tool development far ahead of domestic efforts.

#### 4.1 Domestic Evaluation and Application of Physical Literacy

Domestic research on physical literacy evaluation and application can be examined from three perspectives. **Theoretically**, Zha Maoyong (2014) [17] and Jiao Jie (2015) [5] constructed evaluation systems based on quality education-centered comprehensive physical development theory, people-oriented health-first concepts, and sustainable development theory. Ma Yong et al. (2016) built evaluation systems based on sports power theory, national fitness theory, and sustainable/ comprehensive development theory [8]. **Methodologically**, Yu Xiu et al. (2012) used Delphi method and Analytic Hierarchy Process (AHP) to construct indicator systems and assign weights [14]. Zha Maoyong (2014) used factor analysis [17]. Jiao Jie (2015) established evaluation models using fuzzy comprehensive evaluation [5]. **In terms of subjects**, Yu Xiu et al. (2012) tar-

geted middle school students [14], Zha Maoyong (2014) [17] and Jiao Jie (2015) [5] targeted university students, and Ma Yong et al. (2016) targeted urban residents [8].

## 4.2 International Evaluation and Application of Physical Literacy

A recent global review indicates Canada has achieved unique “progress” in physical literacy evaluation and application [56]. Currently, three assessment tools enjoy privileged status in Canadian schools and communities [32]: (1) **Passport for Life**, developed by Physical & Health Education Canada (<http://passportforlife.ca/>), is a tool for teachers to understand students’ physical literacy, assessing fitness skills, movement skills, active participation, and living skills. Students complete assessments, input data into an online system, and receive printable passports identifying strengths and improvement areas for goal-setting. Teachers access individual and class data to organize programs appropriately. Assessments include six physical activities and two questionnaires completed in class, with results compiled into student and class passports for year-round progress reflection.

- (2) **PLAY (Physical Literacy Assessment for Youth Tools)**, developed by Canadian Sport for Life (<http://physicalliteracy.ca/education-training/play-tools/>), was originally research-designed with minimal assessment burden (short completion time, convenient equipment, minimal training), excellent reliability, strong validity, easy interpretation, flexibility, and sensitivity to change. The tool quickly assesses movement competence across 18 motor skills [18]. PLAY includes: PLAY Fun (formal assessment of object control and balance by trained professionals), PLAY Basic (simplified version), PLAY Self (child self-assessment), PLAY Inventory (annual activity checklist), PLAY Parent (parent assessment), and PLAY Coach (coach/therapist assessment).
- (3) **CAPL (Canadian Assessment of Physical Literacy)**, developed by the Healthy Active Living and Obesity Research Group at the Children’s Hospital of Eastern Ontario (<https://www.capl-ecsf.ca/>), is the first comprehensive physical literacy assessment tool, accurately and reliably evaluating broad skills and capacities promoting children’s physical activity participation (Longmuir, 2013). Physical literacy encompasses more than fitness or motor skills; CAPL uniquely assesses daily behavior, motivation & confidence, knowledge & understanding, and physical competence.

Since 2008, the Healthy Active Living and Obesity (HALO) Research Group has led CAPL development, recognized through assessments of over 10,000 children and input from 100+ researchers and practitioners. After big data analysis, HALO launched CAPL-2 on October 27, 2017 (<https://www.capl-eclp.ca/>), a shorter, more manageable test series for assessing and monitoring physical literacy in Canadian children aged 8-12.

On October 2, 2018, HALO at CHEO released Canada's first "State of the Nation" report on children's physical literacy, revealing approximately two-thirds of Canadian children do not meet acceptable physical literacy levels. Physical literacy includes motivation, confidence, physical competence, knowledge, understanding of physical activity value, and responsibility for lifelong participation. The release included 14 papers on physical literacy and CAPL in a *BMC Public Health* special issue. Over 10,000 children aged 8-12 from 11 cities participated in 2014-2017 research using CAPL. These papers, covering many assessment domains, indicate more work is needed to ensure Canadian children's physical literacy. HALO has spent a decade developing and refining CAPL—a valid, reliable, feasible tool for national and international use—providing the first comprehensive assessment of Canadian children's physical literacy.

As shown in Table 2, we compare Canada's three major online physical literacy assessment platforms, detailing assessment names, research institutions, target ages, applications, dimensions, measures, performance representations, tools, and assessor qualifications. The three platforms share similarities while maintaining unique characteristics, creating healthy competition and complementarity in Canadian physical literacy research. Passport for Life focuses on student populations, emphasizing physical education's role, while the others emphasize lifelong sports consciousness cultivation.

## 5.1 Review of Domestic and International Physical Literacy Research

Domestic physical literacy research has achieved certain results: (1) **Content**: Studies on conceptual connotation, structural attributes, operation/measurement, and evaluation/application are similar but repetitive and lack depth. (2) **Subjects**: Research mainly targets primary, secondary, and university students, rarely examining the entire population aged 6-60. (3) **Methods**: Literature review and questionnaire surveys predominate, lacking empirical research, especially in evaluation and application, without forming indigenous measurement and assessment systems. (4) **Perspective**: Research primarily considers physical education and teaching, lacking ecological perspectives from environment and society.

International physical literacy research leads China in several aspects: (1) **Theory**: Emphasizes epistemology and ontology, valuing phenomenological and existentialist interpretations. (2) **Content**: Beyond theoretical 梳理 of connotation and attributes, greater emphasis on measurement, evaluation, and application research, particularly assessment tool development. (3) **Methods**: Values both quantitative empirical research and qualitative methods like interviews, focus groups, and participant observation. (4) **Subjects**: While also focusing on youth, assessment websites cover adults and retirees, with broader research populations.

## 5.2 Urgent Need for Localized Breakthroughs in Physical Literacy Research

China's physical literacy research requires deeper exploration: strengthening theoretical foundations by clarifying conceptual connotation, structural attributes, theoretical bases, and operational definitions; expanding research boundaries by adding longitudinal tracking studies to understand physical literacy formation journeys, monitoring its development, and exploring benefits across the lifespan; investigating enhancement mechanisms and methods; and grounding research in national conditions to construct comprehensive index evaluation systems rooted in Chinese cultural contexts.

Although “knowledge-affection-will-action” (zhī-qíng-yì-xíng) originates from Western psychology, it has long been hailed as the essence of Confucian educational philosophy. As physical education is indispensable for personality and ability development, interpreting physical literacy through this traditional educational thought combined with contemporary Chinese contexts can construct a Chinese-characteristic system integrating Chinese and Western traditions. **Knowledge** refers to cognition and perception of physical activity; **affection** refers to confidence and motivation for physical activity; **will** refers to the willpower and quality of participating in physical activity; **action** refers to behavior and movement in physical activity. With clear structure, operational definitions become explicit. Unity of knowledge and action is crucial for literacy cultivation. As the core of “knowledge-affection-will,” knowledge belongs to psychological constructs measurable at theoretical dimensions, while “action” as a dynamic process cannot be directly measured operationally but can be reflected through behavioral performance outcomes. Thus, motor skills and physical constitution levels can directly measure practical literacy cultivation. Particularly in contemporary China, where sports have not yet become a lifestyle, “action” as a crucial component of physical literacy is especially important. Constructing a physical literacy evaluation and application system based on Confucian “knowledge-affection-will-action” cultivation philosophy holds significant importance for guiding physical education development and promoting the Healthy China 2030 initiative.

## 5.3 Future Research Directions in Physical Literacy

Longmuir & Tremblay (2016) proposed four frontier research questions [41]: (1) **Monitoring physical literacy**: How do cultural and lifespan stage factors affect key components? How do we map progress in adaptive components? How should physical literacy be monitored in typical activity environments? (2) **Understanding physical literacy journeys**: How do journeys vary by personal factors? How do they vary by environmental factors? How do personal and environmental factors interact? (3) **Enhancing physical literacy**: What are key personal factors/targets/features for successful interventions? What are key environmental factors/targets/features? How can personal and environmental

factors be optimized to improve intervention effects? (4) **Benefits of physical literacy**: What are the benefits of high physical literacy levels across the lifespan?

Beyond these questions, cross-cultural physical literacy research is promising. What are the characteristics of physical literacy development pathways under different cultural backgrounds? As part of cultivation education, physical literacy is closely related to socioeconomic and political contexts. How do economic policy and social environmental changes affect physical literacy development? Particularly in China, with urban-rural gaps, regional disparities, and ethnic differences, how do these affect physical literacy development? How do individuals and environments interact during physical literacy formation? What is the relationship between Physical Education (PE) and Physical Literacy (PL)? Is PL merely a PE curriculum goal? Can PL guide contemporary sports reform and development [9]?

*Note: Figure translations are in progress. See original paper for figures.*

*Source: ChinaXiv – Machine translation. Verify with original.*