**Table 1.** A summary of physical literacy definitions (listed chronologically).

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| **Author (Year)** | **Approach** | **Setting** | **Definitions** |
| Morrison (1969: 5) | Performance-Driven | PE | … be creative, imaginative, and clear in expressive movement, competent and efficient in utilitarian movement and inventive, versatile, and skillful in objective movement.  |
| Whitehead (2001: 131) | Holistic | General | … moves with poise, economy and confidence in a wide variety of physically challenging situations.  |
| DCMS (2002: 127) | Performance-Driven | Youth Sport | … the development of agility, balance, coordination, and skill (the ABCs) across a wide range of activities.  |
| Whitehead (2005: 5) | Holistic | General | … the ability and motivation to capitalize on our motile potential to make a significant contribution to the quality of life. |
| Whitehead (2007: 282) | Holistic | General | … the motivation, confidence, physical competence, understanding and knowledge to maintain physical activity at an individually appropriate level, throughout life. |
| Higgs et al. (2008: 5) | Performance-Driven | Youth Sport | … the development of fundamental movement skills and fundamental sport skills that permit a child to move confidently and with control, in a wide range of physical activity, rhythmic (dance) and sport situations. |
| Mandigo et al. (2009: 6-7) | Performance-Driven | PE | … ability to move with competence and confidence in a wide variety of physical activities in multiple environments that benefit the healthy development of the whole person. |
| Whitehead (2010: 11) | Holistic | General | … the motivation, confidence, physical competence, knowledge and understanding to maintain physical activity throughout the life course. |
| Whitehead (2013a: 29) | Holistic | General | … a disposition to capitalize on our human-embodied capability wherein the individual has the motivation, confidence, physical competence, knowledge, and understanding to value and take responsibility for maintaining purposeful physical pursuits and activities throughout the life course. |
| The Aspen Institute (2015b: 9) | Performance-Driven | Youth Sport | … the ability, confidence, and desire to be physically active for life. |
| Sport for Life Society (2015: 1) & Tremblay et al. (2018) | Holistic | Youth Sport | … the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engagement in physical activities for life. |
| UNESCO (2015: 20) | Holistic | PE | … the motivation, confidence, physical competence, knowledge and understanding to maintain physical activity throughout life, and refers to the skills needed to obtain, understand and use the information to make good decisions for health. |
| Jurbala (2015: 377) | Holistic | Sport | … the dynamic communication between the embodied self and the physical environment, which continuously integrates perceptive reading of, and appropriate response to, physical challenges. |
| Sport for Life Society (2016: 73) | Performance-Driven | Sport | … the fundamental movement skills, fundamental sports skills, motivation, knowledge, and understanding that enable an individual to read their environment and make appropriate decisions while moving confidently and with control in a wide range of physical activities in both indoor and outdoor environments. |
| Sport for Life Society (2016: 73) | Performance-Driven | Sport | … have acquired the skills and confidence to enjoy a variety of sports and physical activities. |
| Sport for Life Society (2016: 73) | Performance-Driven | Sport | … demonstrate competence and confidence in fundamental movement skills and foundation sport skills combined with the ability to read their environment and make appropriate decisions. … enjoy a variety of sports and physical activities. |
| Sport for Life Society (2016) | Performance-Driven | Sport | Same as PHE Canada (2007). |
| Allan et al. (2017: 523) | Integrated | Sport | … the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engagement in physical activities for life. |
| IPLA (2017) | Holistic | General | … the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engagement in physical activities for life. |
| Keegan et al. (2019: 111) | Holistic | General | … lifelong holistic learning acquired and applied in movement and physical activity contexts. |
| PHE Canada (n.d.) | Holistic | General | … a journey upon which children and youth, and everyone, develop the knowledge, skills, and attitudes they need to enable them to participate in a wide variety of activities. |
| SHAPE America (n.d.) | Performance-Driven | Youth Sport | Same as Mandigo et al. (2009)  |

*Note*: DCMS: Department for Digital, Culture, Media and Sport; IPLA: International Physical Literacy Association; PHE: Physical and Health Education; UNESCO: The United Nations Educational, Scientific and Cultural Organization.

**Table 2.** Physical literacy components as articulated in notable existing publications.

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| **Authors (year)** | **PL Components** |
| Allan et al. (2017) | Character; competence (physical fitness; technical, tactical and motor skills); confidence; connection; knowledge and attitudes; physical activity behavior. |
| Corbin (2016) | Cognitive skills; confidence; interaction with others; motivation; motor skills; perception of environment; physical activity; physical fitness; responsibility for engagement for life; responsibility; values in physical activity. |
| Edwards et al. (2017)*Note*: The numbers in parentheses represent the number of papers that referred to. | Confidence (26); develop whole person (15); human disposition (8); knowledge and understanding of activities (16); motivation (23); movement with poise and economy (5); physical activity (22); physical competence (12); purposeful physical pursuits (6); read/interact with environment (14); throughout the lifespan (19); unique journey (7); valuing and responsibility for physical activity (2). |
| Hyndman and Pill (2018)*Note*: % in parentheses represent level of relevance to physical literacy | Education (87%); activity (72%); fitness (72%); health (71%); concept (70%); competence (70%); understanding (69%); role (69%); curriculum (67%); assessment (65%). |
| Mandigo et al. (2009) | Beneficial to and respectful of themselves, others and their environment; confidence and competence; creativity (e.g., applying skills in new and novel environments); diverse forms of movement; health-related fitness; healthy active choice; lifespan healthy behaviors and PA participation; motivation; strategic thinking; understanding, communication, application and analysis. |
| McClelland (2013) | Confidence and physical competence; interaction with environment; knowledge and understanding; motivation; self-expression and communication with others; sense of self and self-confidence. |
| Patriksson and Persson (2013) | Competence; environment; expression & interaction; knowledge and understanding; motivation; sense of the self. |
| Dudley (2015) | Motivation and behavioral skills of movements; movement competencies; personal and social attributes of movement; rules, tactics, and strategies of movement. |
| The Aspen Institute (2015b) | Ability; confidence; desire. |
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| The Sport Australia (n.d.) | Physical capability; psychological capability; social capability; cognitive capability. |

**Table 3.** Summary and analysis of the existing physical literacy assessment tools.

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| **Name** | **Year** | **Population** | **Domains or Components** | **User** | **Scoring** | **Time** | **Strength** | **Limitation** |
| Physical literacy assessment for youth (PLAY) | 2009 |  Seven yr old or above | Cognitive; affective; physical competence; participation  | PE specialist /coach; self-report; parents | No composite score; separate score for each PL component | Long | Research and program evaluation; assess multiple PL components; free; applicable in multiple contexts; may assess in groups of 2+ | No measure for physical activity & fitness; inadequate measurement of confidence |
| Canadian Assessment of Physical Literacy (CAPL) | 2014 | Eight - 12yr old | Physical competence; knowledge and understanding; motivation; Confidence | Coaches or PE teachers | Composite PL score and separate scores for components | 30 – 45 min | Comprehensive; Population-based surveillance tool; weighted scores of PL components  | High composite score does not offset low component score |
| Physical Literacy Observation Tool (PLOT) | 2017 | Early-year children -preschoolers | FMS | Parents and educators  | Reflective feedback | NA | Easy to handle (observing and referring) | Sole focus on FMS |
| PHE Canada - Passport for Life (PPL) | 2013 | Third - 12th grade | Activity participation; living skills; fitness skills; movement skills | Generalists or PE specialists | Four-level scale; two measurements per school year; self-reported & observation  | Long  | Formative assessment; free of charge; separate assessment tools for age ranges | Not for summative assessment; three teachers for administration |
| 60 Minutes Kids Club (60 MKC) PL Assessment Tool | NA | Fifth to 12yr old | FMS; physical activity & sedentary behavior | Generalists, parents, coaches or caregivers | Four-level scale  | 30 mins  | Free of charge; quantify skill progress; easy to handle; age specific (three–five, five–eight, and eight-12 yr old); self-assessment allowed | Mere focus on FMS, physical activity and sedentary behavior; for school use only |
| PL tools endorsed by SHAPE America | 2011 | Third- 12th grade | Motor skills; knowledge; physical activity; physical fitness; motivation | PE specialists, staff or trained researchers | No composite score; separate scores for components | Long | Valid & reliable | No composite score, not comprehensive |
| Perceived Physical Literacy Inventory (PPLI) | 2016; 2018 | 11 to 19yr old; and adults | Knowledge and understanding; self-expression & communication; sense of self & self-confidence | Self-report | Nine items on five-point Likert scale; separate scores for sub scales | eight-10 mins | Valid and reliable; easy to handle | Not comprehensive; PL components unweighted  |
| The Preschool Physical Literacy Assessment Tool (Pre-PLAy) | 2018 | 18 months to 4yr | Movement competences; coordinated movements; motivation; & enjoyment | Early Childhood Educators | 19 items with visual analog scale and rubric; separate scores for different components; total PL score available | Short - Long | Easy to handle; observation only | No cognitive aspect assessment; need further validation for some items to measure both boys and girls. |

*Note*: PL: physical literacy; FMS: fundamental motor skills; PHE: Physical and Health Education; SHAPE: Society of Health and Physical Educators.

**Table 4.** Summary of PL interventions.

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| **Name (Year)** | **Program** | **Purpose** | **Research Design and Intervention** | **Participants** | **Main findings** |
| Bélanger et al.(2016) | Healthy Start-Départ Santé | To promote daily physical activity and healthy eating habit for young children by engaging multi-level intervention. | RCT design; informed by the Comprehensive Behavior Change Models and Social Ecological Model. Six intervention components: implementation guide, partnerships, evidence-based resources, additional resource, training and mentoring, & knowledge development and exchange. Duration = six to eight months.  | Three-five yr olds from 61 childcare centers. | NA |
| Chen et al.(2017) | CATCH PE | To promote children and adolescents’ health-related fitness, physical competence, and PA attitude. | Pre- and post-test design (two-year intervention). Year one: PE teacher received training in CATCH School Workshop; PE teacher designed PE course plans and delivered 37 CATCH PE lessons. Year two: PE teachers delivered 55 CATCH PE lessons.  | 1223 to 1588 elementary school students aged 5.5 on average | Significant increase in four motor skills (running, dribbling, weight transferring and underhand catching) across cohorts with year two scored the highest. |
| Collins et al. (2010) | The Potential of Young People in sport (DPYPS) program | To promote lifelong PA and develop children’s talent. | Mixed methods study (semi-structured interview; pre- and post-test & between-group research design).Two-year intervention in Scotland. Applied physical and mental skills in lessons and activity clubs to foster short-term physical activity participation and long-term change in mental correlates for success.  | Senior primary school students (*n* = 487); year one (*n* = 312) and year two (*n* = 261) secondary school students. | Significant improvement in activity level, self-determination, perceived competence and self-motivation at posttest from pretest, as supported by qualitative data. |
| Demetriou et al. (2018) | Sports-oriented school curriculum | To examine whether a sports-oriented primary school can change PL and cognitive performance. | Quasi-experiment design. The intervention school received physical activity intensified curriculum (90-min PE and recess); while control school received regular curriculum (i.e., 45-min PE).  | Primary school students (*N* = 169; age: 8.06 ± 1.21; male = 59.8%) from two schools. Intervention: *n* = 79; control: *n* = 90. | Significant increases in attitude towards PE and physical fitness (standing long jump, balancing backwards and six-min run).  |
| George et al. (2016) | Nintendo Wii Games (active video games: AVGs) | To explore the impact of Nintendo Wii Games (active video games: AVGs) on PL. | Pre- and post-test research design. Six weeks of AVGs selected from Nintendo Wii system, Wii Sport, Wii Sport Resort, Wii Play and Just Dance 2. Students played on one of the four AVGs for at least 20 min twice a week.  | Children aged between six to 12 | Positive impact of AVGs experiences on PL components. Specifically, improvements in aiming and catching (*p* = 0.06), males’ manual dexterity (*p* < 0.01), and females’ physical activity engagement pressure (*p* < 0.01). |
| Houser et al. (2019) | The Physical Literacy in the Early Years (PLEY) intervention | To examine the efficacy of PLEY program in improving children’s PL. | Randomized mixed methods controlled trial. Six-month intervention program as informed by social ecological model and RE-AIM framework. Interventional care centers received equipment kits. Center staff attended professional development workshop.  | Children (*N* = 183) aged three – five. | NA |
| Johnstone et al. (2017) | Go2Play active play intervention | To promotes students’ PL (i.e., PA level and FMS) using the Go2play active play as a school-based intervention. | Controlled experimental design without randomization. Intervention arm (Go2play; *n* = 172), control arm (no intervention; *n* = 24). Intervention program informed by Whitehead’s PL definition (2001) to promote PL. Intervention incorporated structured games and free play (30 min each) in an outdoor environment for one-hour to foster physical activity enjoyment. Duration: five months.  | 172 students from seven elementary schools with average age of seven yr old. | Significant interactive time-to-treatment effect on mean counts per minute and percent time in sedentariness, light intensity PA and moderate to vigorous PA for school day PA. Interactive effect on gross motor quotient, percentile, locomotor skills scores and percentile. |
| Kiez (2015) | Circus Arts Instruction | To investigate how the Circus Arts Instruction PE improves PL measured by the PLAY. | Prospective, clustered quasi-experimental design. Circus Art Instruction incorporated PE (three schools; *n* = 110) vs. standard PE (three schools; *n* = 101). PE Circus schools provided circus arts instruction using minimal equipment (clowning, juggling, balance activities), “social circus” approach, physical and health education (PHE); 56.7 min/PE class, three times/week, 170 min/week. Standard PE schools provided standard PHE curriculum and delivery methods; 68 min/PE class, 3.3 times/week, 225 min/week. | 211 grade four and five students aged between nine to 12 | A group effects favoring Circus Arts Instruction on: PLAY*Self* (cognitive sub-domains of PL, importance of movement), PLAY Inventory (number of physically active pursuits), PLAY*Coach* measures (overall PL, cognitive sub-domains and environment participation, motor competence and overall fitness), PLAY*Parent* (balance) and PLAY*Fun* (movement skills). |
| KiWi Sport, (n.d.) | KIWI Sport program | To promote school-aged children’s PA and sport. | 39% of the projects increased skills and 26% increased opportunities and competitions for participation; and 84% were run during school time and 16% during weekends and holidays (Kiwi Sport, n.d.). | Children aged between one to 13 yr old. | NA |
| Kozera (2017) | Running, Jumping and Throwing (RJT) program | To examine the efficacy of RJT-PE in promoting PL. | Quasi-experimental design. RJT-PE (*n* = 111; males = 65) vs. regular PE (*n* = 76; males = 42). Protocol: eight weeks, three classes per week, class duration: 30 to 50 minutes. Lesson plan: 1. a group discussion and visualization exercise; 2. warm-up; 3. skill drills; 4. participatory task/game, and; 5. cool down/closure including reflection. | 199 students aged between seven to 12 | Both a time (*p* < 0.01) and a group (*p* < 0.05) impacts on motor competence for third (*ES* = 0.94) and fourth (*ES* = 0.67) grade favoring RJT-PE. |
| Lavery et al.(2017) | Mentorship & Lunch hour (LH) games | To examine how children’s overall PL and FMS responded to LH games program, mentorship program and a combination of the two programs. | Quasi-experimental design. The LH games program: 16 weeks, two × 30-minute sessions/week (32 sessions in total), four schools; control, mentorship program, and the combined (mentorship & LH games) program: eight weeks, two × 30-minute sessions/week (16 sessions in total). The PL and FMS were assessed using Sport for Life Society’s PLAY*fun* tools. | LH games program: first to sixth graders, four schools; mentorship program and combined program: first to third graders, four cities. | More longitudinal increase in overall PL score across time points; more FMS increase in mentorship program than combined group. |
| Lee et al. (2018) | Y Kid Academy Program | To promote PA, knowledge and health lifestyle. | Pre- and post -test research design. Community-based class session (instruction = 0.5 Hr and exercises = one Hr): eight \* 1.5 Hr; 2/week \* four weeks. Summer camp (same class) session: eight\*1.5Hr (30 hours in total across four days).  | 163 children between ages nine – 14; boys = 55%. | Significant improvement in the healthy lifestyle knowledge at posttest compared to the pretest.  |
| Mandigo et al. (2019) | PlaySport intramural program  | To examine elementary school students’ PL development in a TGfU-based after-school program. | Single group pre and post design. Eight weeks of 25 after-school TGfU -based lessons with PlaySport activities. 60 minutes per lesson consisted of three sections: introduction, movement development and integrative-approach culmination. Majority of the lessons taught by two graduate students.  | Elementary school students (*N* = 22, male = 27%).  | Significant increases in Fitness skills (i.e., balance / stability, *p* < 0.01; cardiovascular, *p* < 0.01) and active participation (i.e., diverse environments, *p* < 0.01; diverse interests, *p* < 0.01). |
| McGrane et al.(2018) | Y-PATH | To examine the efficacy of Y-PATH on PL. | RCT design. Duration: four months. Intervention = exposure to Y-PATH multi-components (i.e., student, parent/guardian, teacher, and website components) PE-based treatment (*n* = 236) and control = regular one PE per week (*n* = 246). Y-PATH underpinned by YPAP model aiming to foster adolescents’ physical activity level over an academic year (eight months).  | 482 students aged between 12 to 15 yr old. | Time-to-intervention effects of Y-PATH on total object control, total locomotor and total FMS. |
| O’Brien et al.(2013) |  Y-PATH | To develop adolescents’ FMS, knowledge, PA, and psychosocial health through the Y-PATH intervention. | Quasi-experimental non-randomized controlled trial design; Y-PATH as intervention (same as above) lasted for 8 months; PA and FMS were measured at three time points. | 174 students aged between 12 to 14 yr old | Significant time and treatment interaction effect on PA and FMS |
| Sum et al. (2018) | Continuing Professional Development (CPD) | To examine the effect of CPD on PE teachers’ and students’ PL. | RCT design. Intervention = 50 hours of CPD training (*n* = 35) vs. control = regular life (*n* = 35). Students were randomly assigned to PE teachers (either intervention or control) to receive different instruction lasting for eight months.  | 70 PE teachers and 6300 students | NA |
| UNESCO (2015) | Passport for Life | To support the development and advancement of PL among students and teachers. | Design: NA. Formative assessment program. Initial assessment and year-end assessment; the program provided teachers with supplementary trainings for implementing quality lessons that can promote students’ awareness, understanding, knowledge, skill and fitness; 330 classes recruited. | 756 teachers, 4325 students | Significant increases in some aspects of fitness, activity participation, interest for activity; non-significant increases in movement competency, feeling of confidence, importance, autonomy and enjoyment, as well as decrease in PA anxiety. Student participants demonstrating certain levels of life skills, knowledge and understanding for healthy lifestyle. |
| Wainwright et al.(2018) | Foundation Phase in Wales (FPW) | To examine how the FPW program facilitates PL development. | Mixed method design. Intervention underpinned by holistic approach of PL. Intervention = play-based curriculum lasted for 10 months with three-time points of measurement. | 49 children aged three to seven | Significant improvements in locomotor skills, Gross Motor Quotient and perceived physical competence scores |
| Youth Sport Trust (YST) (n.d.) | YST UK – Start to Move (STM) | To facilitate PE teachers’ instruction and its effect on children’s PL. | Design: NA. The study implemented Bupa STM on children’s PA behavior and FMS, by helping teachers deliver PE instruction and promote PL.  | Children aged between four to seven. | A 7% and a 11% increase in TPA and FMS, respectively. |

*Note*: PL: physical literacy; PA: physical activity; TPA: total physical activity; FMS: fundamental motor skills; PLAY: physical literacy assessment for youth; CATCH: Coordinated Approach to Child Health; RCT: randomized controlled trial; RE-AIM: reach, effectiveness, adoption, implementation, and maintenance; TGfU: Teaching Games for Understanding; YPAP: youth physical activity promotion (model); Y-PATH: Youth-Physical Activity Towards Health.