Associations of Physical Literacy, Physical Activity Behavior, and Physical Wellbeing among Primary School Children

Temesgen Abozen[1] *and Getu Teferi*[1]*

[1]Academy of Sport Science, Debre Markos University, Debre Markos, Ethiopia

*Corresponding Author E-mail:- getu_teferi@dmu.edu.et, teferigetu36@gmail.com

Abstract

Introduction: *Physical literacy (PL) is seen as a predictor of physical health and well-being, and it is assumed to provide the foundation for an individual's participation in physical activities. However, there is limited data linking PL to children's health and physical activity habits. The purpose of this study was to describe the PL level of children, determine grade and gender differences, the association between PL, physical activity behavior (PAB), and physical well-being (PW) and whether the relationships are mediating by PAB.* ***Methods:*** *The research design of this study is a cross-sectional study design, data from elementary schoolchildren aged 7–12 years were collected from January to May 2022. PL was computed from measures of PlayFun, PlaySelf and CAPL-2-KU, PAB from the YAP (Youth activity profile) and PW from the KIDSCREEN questionnaire. Descriptive statistics, independent t-tests, Pearson's inter-correlations, one way ANOVA were done in SPSS version 24 and structural equation model (SEM) with AMOS software for the association of PL, PAB and PW.* ***Results:*** *The psychomotor domain of schoolchildren's physical literacy was rated at a competent level (66.1%). In the psychomotor and affective domains, there was a significant mean difference between boys and girls p = .00) as well as grade level (P =.00), but not in the cognitive, PW, or PAB domains. PL was significantly associated (p = .000) with PW and mediated by PAB (β=0.34) and a moderate direct association with PW (β=0.46).* ***Conclusions:*** *The PL of school children was at competent level. Higher PL was linked to boys and increasing with grade levels. The study adds to the body of evidence that PL, physical activity, and PW are linked; further PAB has the mediating role in the association of physical literacy and physical wellbeing.* ***Recommendation:*** *School leaders, physical education teachers, coaches, and families should all play an important role in encouraging and fostering PL in children.*

Keywords: Play tools, children, physical well-being, physical activity, health and physical literacy

1. Introduction

Physical literacy, which is defined as having the motivation, confidence, physical competence, knowledge and, understanding to value and accept responsibility for engaging in physical activity (PA) for life, is thought to be the basis for lifetime physical activity participation (Tremblay, Costas-Bradstreet, et al., 2018) This definition of physical literacy includes four interconnected elements (affective, psychomotor, cognitive, and behavioral) that change and adapt across the lifespan (Tremblay, Costas-Bradstreet, et al., 2018). Understanding the educational support of PA at an early age can increase these behaviors throughout life because it is positioned as a foundation for lifelong participation (Cairney et al., 2018; Roetert, Ellenbecker, & Kriellaars, 2018; Whitehead, 2019). Physical literacy has emerged as a potential alternative to address the global issue of physical inactivity (Pot, Whitehead, & Durden-Myers, 2018). It is generally known that engaging in regular PA is an essential component of a healthy lifestyle. Physical and mental health indicators are linked to PA (Carson, Tremblay, Chaput, & Chastin, 2016; Lubans et al., 2016; Poitras et al., 2016; Warburton & Bredin, 2017). Childhood is a critical life stage for promoting and establishing healthy lifestyle habits (Lu & Montague, 2016). Children can develop physical skills, motivation, and confidence through high-quality, positive PA experiences during childhood, all of which have been linked to increase PA and decreased sedentary behavior (Barnett, Stodden, et al., 2016; Logan, Kipling Webster, Getchell, Pfeiffer, & Robinson, 2015; Owen, Smith, Lubans, Ng, & Lonsdale, 2014; Tremblay, Costas-Bradstreet, et al., 2018).

It is abundantly clear that there is an immediate need to raise global levels of physical activity. Physical, behavioral, and well-being of international interest in physical literacy continues to grow (Barnett et al., 2019; Cairney et al., 2018). The term "children and youth" is the focus of much of the current physical education work (Edwards, Bryant, Keegan, Morgan, & Jones, 2017). The growing belief that physical education can influence PA, health, and well-being is reflected in this focus (Jess, Keay, & Carse, 2016). Recently, attention has been focused on the potential of physical literacy (PL) for PA- and health promotion (such as physical well-being) (Edwards et al., 2017). PL is a complete,

multi-component idea that explains important individual prerequisites for participating in and adhering to PA throughout one's life (Melby et al., 2022). Cross-sectional studies have shown correlations between children's PL and PA (Belanger et al., 2018), sedentary behavior (Saunders et al., 2018), cardiorespiratory fitness (Lang et al., 2018) and screen time (Saunders et al., 2018). Studies have also shown an association between PL and indicators of children's general health (Caldwell et al., 2020; Delisle Nyström et al., 2018). Collectively, these findings suggest that PL is an important potential factor for health.

PW is a crucial component of good child development and health (Casas, 2011). Similar to PL, PW is often characterized as multidimensional, reflecting and originating from social, affective, and physical processes. To the best of our knowledge, though, relatively few studies have looked at the relationships between PL and various aspects of children's PW (Caldwell et al., 2020; Melby et al., 2022). Further, there is still a lack of research, particularly in Ethiopia, on the connections between PL, PA, and physical well-being, the level of PL, grade, and gender differences in PL. It is possible that PL could be a determinant of wellbeing because the affective domain of PL includes autonomous motivation, which has a positive relationship with physical well-being (Caldwell et al., 2020). Further, according to the theory of PL, children with high PL increase their possibility of having positive experiences in PA (Whitehead, 2013).

Physical literacy (PL) is seen as a predictor of physical health and well-being, and it is assumed to provide the foundation for an individual's participation in physical activities. However, there is limited data linking PL to children's health and physical activity habits (Melby, Elsborg, Bentsen, & Nielsen, 2023) and limited studies have investigated a simultaneous relationship among PL, PA behavior, and well-being(Dong et al., 2023). To the researcher knowledge, the first description of physical literacy among school-age children in Ethiopia may provide by this study. The objectives of this study are to: 1) describe the level of children's physical literacy 2) identify differences in physical literacy by grade and gender; 3) investigate the association between physical literacy, physical activity behavior and physical well-being; We hypothesized that PAB would act

as a mediator between children's PL and their physical well-being (Fig. 1).

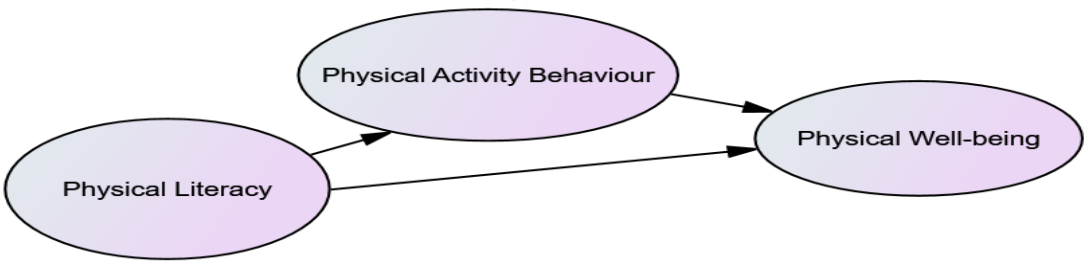


Figure 1 Hypothesized paths between study variables, with physical well-being as the outcome

2. Methods and Materials

2.1 Study design and participants

In this study a cross-sectional research design was employed. This cross-sectional study was carried out from January to May 2022 in the East Gojjam, Zone, Ethiopia. The methodological quality and ethical concern of this study was evaluated and approved by the research ethical committee of department of sports science, Debremarkos University (Ref. no.SPSC05/2021, date of approval 08, December, 2021).

To achieve the purpose of this research, five hundred and fifty (550) students in grades 1-4 from two elementary schools in Amanuel town, East Gojjam, Ethiopia (260 males and 290 females) were a target population. Different literatures were suggested that for populations under 1000, a minimum ratio of 30 percent is advisable to ensure representativeness of the sample (Nardi, 2003; Neuman, 2007; Suskie, 1996). As a result, one hundred sixty five (165), plus 10 % non-return rate, totally 182 sample students were randomly selected, however 165 students (87 female and 78 male) were successfully completed the data collection process and used as study sample. Before the study started, students were told about the objectives and procedures of the study and received written parental consent.

2.2 Variables and measurements

The two researchers translated the original versions of each questionnaire into Amharic and back translated into English by the third expert. However, because this was the first study in which instruments were used in Amharic, the questionnaire was used twice over the course of seven days to assess the measurement tool's test–retest reliability.

Physical Literacy: sport for life created a set of assessment tools known as the PLAY Tools to evaluate various aspects of physical literacy (Caldwell et al., 2020). In this study, the Physical Literacy Assessment for Youth (PLAY) instruments (PLAYfun) was used to describe the physical literacy of children (Tools, 2014). PLAY tools were created to evaluate the program and as research (Kozera, 2017). PLAY tools were developed at the University of Manitoba in 2009-2010 and released to Canadian Sport for life in 2012 for open source distribution (Tools, 2014). These tools are appropriate for ages 7 and older children. PLAY tools were consistently designed as research evaluation tools for the physical literacy. Participants' physical and affective domains were assessed using the PLAYfun and PLAYself instruments from PLAY Tools (Caldwell et al., 2020).

Cognitive domain: there were a total of twelve questions on the CAPL-2-KU survey to measure cognitive domain. These included guidelines for how much time should be spent doing physical activity and how much time should be spent sitting down, a definition of cardiorespiratory fitness and muscular strength, comprehension of fitness and its effect on physical activity, and strategies for skill development and fitness enhancement (Longmuir, Woodruff, Boyer, Lloyd, & Tremblay, 2018). There were four answers to each question; the score for a correct response was 1, and the score for an incorrect response was 0. The highest possible score was 12. In Canadian children, this questionnaire was found to be feasible, trustworthy, and valid (Longmuir et al., 2018).

Physical well-being: physical well-being was assessed with 5 items from the KIDSCREEN parent version (Ravens-Sieberer et al., 2007). The sub dimension physical well-being covers the level of the child's PA (1 item), energy (1 item), and general health (2–3 items). Parents were first asked; In general, how would your child rate her/his health? (excellent, very good, good, fairly, poor), and then they were asked to

think about the last week and answer on a 5 point Likert scale (from poor/ not at all/never to excellent/extremely/always); Has your child felt fit and well?; Has your child been physically active (e.g. running, climbing, biking)?; Has your child been able to run well?; and Has your child felt full of energy?.

Physical activity behavior (PAB): PAB was measured with the Youth Activity Profile, also known as the YAP. The PA at School Index (PASI), the PA at Home Index (PAHI), and the sedentary behavior Index (SBI) are the three indices of PAB (Saint-Maurice & Welk, 2015). There are a total of 15 items, each of which has a score of five points. The first five items assessed PA at school by asking about behavior during various school times, such as transportation, PE, recess, and lunch. The five subsequent questions inquired about home PA levels. The number of days they were active before school, after school, and on weeknights was asked in three questions. The responses were selected between four and five days at the most and 0 days at the minimum. Two more questions specifically inquired about how much time they devote to physical activity on Saturday and Sunday. The final five items included time spent doing various sedentary activities (watching television, playing video games, using a computer, texting or using the phone, and sitting in general).

2.3 Methods of data analysis

Normality of the data was assessed with the Shapiro-Wilk test and the internal consistencies of each questionnaire were assessed by using intra-class correlation coefficient (ICC). Descriptive statistics (mean, standard deviation, number, percentage) were used. Gender difference was examined with independent t-test. Pearson correlations for relationships and one way ANOVA for grade differences were used. Associations between PL, PAB and physical well-being, (hypothesized model in Fig. 2) were investigated through structural equation modeling (SEM) in IBM SPSS Amos software (Arbuckle, 2011).

We followed recommended criteria for acceptable level of a good model fit: The chi-square test of model fit ($\chi 2$/df ratio with non-significant p value), the Goodness of Fit Index (GFI > 0.95),Tucker-Lewis index (TLI> 0.95), comparative fit index (CFI > 0.95), normed fit index (NFI > 0.95), and root mean square error of approximation (RMSEA < 0.05) (Hox & Bechger, 1998; Whittaker, 2011). All statistical analyses

were performed in SPSS (Version 24) and statistical significance level was set at $p < 0.05$.

3. Results

3.1 Description of the sample and study variables

The mean age of the study participants was 9.36 (SD=2.034) years and 52.7 % were girls. The number of participants with data means scores, standard deviations, skewness, kurtosis and ICC for continuous data and number and percentage for categorical data are reported in **Table 1.** The psychomotor domain level of participants from PLAY Fun tool has shown that; emerging 45 (27.3 %), and competent 109 (66.1%), proficient only (7 (4.2%). In play self-description component of physical literacy, participant children categorized in high self-efficacy 105 (63.6) and very high self-efficacy 7 (4.2) and their cognitive mean score was 7.74 (2.46) out of 12 maximum points (Table 1). In this regard the majority of participants were categorized in competent level and under high self-efficacy.

Table 1: Description of sample on physical literacy, physical wellbeing, physical activity behavior

Variables		N (%)	Mean	SD	Skewness	Kurtosis	ICC	95% CI
Age		-	9.36	2.034	.653	-.427		
Gender	Male	78 (47.30)						
	Female	87 (52.7)						
Grade	Grade one	44 (26.7)						
	Grade two	41 (24.8)						
	Grade three	37 (22.4)						
	Grade four	43 (26.1)						
Psychomotor domain (PlayFun)			58.41	13.75	-.308	-.472	.94	.92-.95
	Initial	4 (2.4)						
	Emerging	45 (27.3)						
	Competent	109 (66.1)						
	Proficient	7 (4.2)						
Affective domain (PlaySelf)		-	71.9	10.19	-.019	-.883	.94	.92-.96
	LSE	-						
	HSE	60 (36.4)						
	VHSE	105 (63.6)						
Cognitive domain (CAPL-2-KU)		-	7.74	2.46	-.411	-.345	.96	.95-.97
Physical wellness			3.15	1.06	-.381	-1.06	.98	.95 -.97
PASI			2.98	1.18	-.067	-.899	.84	.79-.89
PAHI			3.1	1.15	-.058	-.911	.91	.87-.93
SBI			2.24	1.75	-.066	-.954	.96	.95-.97

Key: Data presented as mean (SD) for continuous variables and number and percentage for categorical

Variables, number of participant (165), SD: Standard deviation, PHI: Physical activity at home index, PASI: Physical activity at school index, SBI: Sedentary behavior index, HSE: High self-efficacy, LSE: Low self-efficacy, VHSE: Very high self-efficacy, ICC = intra-class correlation; 95% CI = 95% confidence interval.

Table 2 presents the independent t-test of gender difference of PLAYFun 7.88 (t = 4.53, df = 163, p = .00) and Play Self 2.8 (t = 2.8, df = 163, p = .00). However no significant difference was observed in cognitive, physical wellness, physical activity and sedentary behavior. Generally the independent sample t-test results revealed that there was statistically significant gender difference in physical literacy amongst school children

Table 2: Independent t-test for gender difference

Variables	T	df	Sig. (2-tailed)	Mean Difference	Std. Error	95% Confidence Interval of the Difference	
						Lower	Upper
Play Fun	4.53	163	.00	7.88	1.74	11.31	4.44
Play Self	2.8	163	.00	4.36	1.56	7.44	1.29
Cognitive	.21	163	.83	.08	.38	.84	.68
Physical wellness	-.55	163	.59	-.09	.16	-.24	.42
PAB	-.25	163	.81	-.04	.17	-.29	.38
SBI	.14	163	.89	-.04	.27	-.5	.57

One-way ANOVA with a Post hoc test was used to examine the primary school children's grade differences in physical literacy, physical activity behavior and physical wellness. This Post hoc test has shown multiple group comparisons for grade differences of PLYFun mean score: grade1 vs grade 2 (MD = -2.4, p = .000); grade 1 vs grade 3 (MD= -19.7, p = .000); grade 1 vs grade 4 (MD = -25.4, p .002), grade differences of Play self: (MD = 5.69, p = .002); grade 1 vs grade 3 (MD= -8.35, p = .000); grade 1 vs grade 4 (MD = -18.45, p .002) and grade differences of cognitive domain: grade1 vs grade 2 (MD = -2.4, p = .000); grade 1 vs grade 3 (MD= -4.69, p = .000); grade 1 vs grade 4 (MD = -4.78, p = .000). In this study psychomotor domain, affective domain, cognitive domain, physical wellness and physical activity behavior amongst the primary school children have shown that statistically significant differences were reported across grade level. Here grade level increases with physical literacy, physical wellness and physical activity behavior proportionally except sedentary behavior and there is no significant difference between grade three and four.

3.3 Pearson's correlation among study variables

Inter-correlations for the subdomains of PL, PAB, and wellbeing are reported in **Table 3**. The correlation coefficient of psychomotor domain with physical wellbeing was (r= .63, p< 0.001), PAB (r = .67, p < 0.001), SBI (r = -.65, p < 0.001), age (r = .70, p < 0.001) and with affective domain (r = .72, p < 0.001). The subdomains of all PL score correlates significantly with physical well-being and PAB in the assumed favorable directions.

Table 3: Pearson's correlation among study variables

		1	2	3	4	5	6	7
1	Cognitive							
2	PLAYFun	.68**						
3	PLAYSelf	.67**	.72**					
4	PWMean	.65**	.63**	.57**				
5	PAB	.72**	.67**	.60**	.66**			
6	Grade	.77**	.83**	.80**	.74**	.79**		
7	SBI	-.59**	-.65**	-.60**	-.60**	-.70**	-.73**	
8	Age	.63**	.70**	.65**	.61**	.62**	.83**	-.55**

** indicates a p-value < 0.01

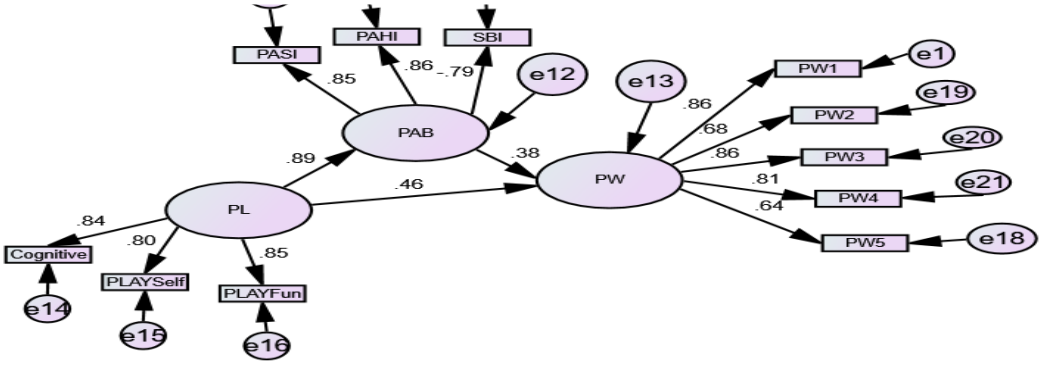
3.4 Associations among PL, PAB, and physical well-being

Figure 2 shows the SEM with physical well-being as the outcome. All standardized path coefficients (β) and p-values are presented in (Table 4). The SEM analysis has showed that PL and PAB were significantly and positively associated with physical well-being (Fig. 2). The model showed good model fit indices (CFI=.99, TLI=.99, RMSEA=.03, $\chi 2$ /df ratio = 1.25, p = .13, NFI =.96, GFI = .95). The path coefficients indicate that PL and PAB are both of importance for children's physical well-being. The association between PL and physical well-being was significantly mediated by PAB (β=0.34, p=.000). There was a moderate direct association between PL and physical well-being (β=0.46, p=.000). Overall, the model with PL and PAB variables accounted for 80% of the variance in physical well-being.

Table 6: path coefficients, R^2 and standardized total effect in SEM with physical wellbeing

Correlations	Standardized regression weight	SE	P-value
PAB ← PL	.89	.03	.01
PW ← PAB	.38	.07	.02

PW ← PL	.46	.06	.000
Mediating paths			
PW← PAB ← PL	.34	.02	.000
PW← PL	.46	.06	.000
Total	.80	.05	.000
Outcome variable	R-square		
PAB	.80	.05	.01
PW	.66	.08	.02



.

Figure 2: Path coefficients of the SEM with physical well-being as an outcome. All the parameters (β) were standardized and were statistically significant

4. Discussion

4.1 Physical literacy status

PL is a rapidly emerging concept. It is regarded as a strategy for increasing social participation for health and wellness benefits. However, PL among Ethiopian school-age children is first may described in this study. The physical domain results from PLAYfun indicated that the majority of students were placed in competent level. Most of the time, this result may be, because kids are used to doing sports and other physical activities both inside and outside of school. On the other hand, some research findings were found to be low or at the "progressing stage" (Robinson & Randall, 2017; Rokholm, Baker, & Sørensen, 2010). Others showed that the need for specific interventions (Belanger et al., 2018; Tremblay, Longmuir, et al., 2018).

4.2 Physical literacy and gender

The mean level of PL differed significantly between boys and girls. However, there was no significant difference in the cognitive

domain. Boys scored higher than girls in the physical domain. In line with our findings, the boys had better PL score than the girls, (Belanger et al., 2018; Longmuir et al., 2015; Tremblay, Longmuir, et al., 2018) and specifically physical domain (Belanger et al., 2018). In general, boys can compete, and are active during or after school. They may be more involved in sports for cultural reasons. Therefore, these may have an impact on early childhood physical activity and better motor skills. In line with the present study, boys showed better motor skill scores than girls (Barnett, Van Beurden, Morgan, Brooks, & Beard, 2009). In other hand, girls face many problems in their sport participation, the majority of which have lack of motivation in different sport participation. These problems include: girls are unhappy with their body structure (Sport & England, 2017), low confidence to participate in PA and a focus on competition is less desired by girls than boys (Sport & England, 2017) and girls from culturally diverse backgrounds are less likely than their classmates to engage in physical activity, mostly because it makes them uncomfortable (England, 2018). However, to alleviate those barriers, schools have a vital role to play to support girls in their development of physical literacy (Doherty, Lee, Keller, & Zhang, 2019).

4.3 Physical literacy and grade level

The results of this study showed that children in primary school had different PL scores across grade level (grade 1 to 4). This indicates that they differ in their motivation, self-assurance, exercise and sports knowledge, and understanding, but no differences were found between the third and fourth grades. Here, age differences differ in curriculum as well as literature. Regular physical activity and movement concepts, principles, and related life skills should improve with grade level (Ince, 2019). In accordance with this, our findings revealed that PL score increased with grade level (physical and affective domain). Age and the fundamental components of motor skills are positively correlated (Barnett, Lai, et al., 2016).

4.4 Association of physical literacy, physical activity, and physical wellbeing

The results of this study indicate that PL is associated with important aspects of children's physical well-being. First, we observed a positive moderate association between PL and physical well-being which was partly mediated by PAB. The observed association between PAB and physical well-

being was positive and moderate indicating that PL is important for children's physical well-being and that some of this relationship works through the level of PA (Elsborg et al., 2021) According to the theory of PL (Elsborg et al., 2021), when an individual's PL is positively developed in a movement context, all of the elements are positively stimulated including the affective elements of motivation and confidence. Thus, children with greater PL score increase the possibility to have positive experiences in PAs (Elsborg et al., 2021), and thus increases the possibility to feel well-being in PA's which is a part of their general well-being. Physical fitness, physical activity, and motor competence ought to be linked to physical literacy (Colley et al., 2017). More recently, the following reciprocal pathways have been proposed to support the idea that physical literacy is a factor of health: increased physical literacy encourages more physical activity, which has favorable physiological, social, and psychosocial adaptations, resulting in improved physical, mental, and social health; this pathway would be present and dynamic across the lifespan from early childhood to old age (Cairney, Dudley, Kwan, Bulten, & Kriellaars, 2019).

5. Conclusion

Based on the results, the majority of participants fell into the competent level (psychomotor domain) and high self-efficacy categories for the play self-description portion of physical literacy. PL rises with grade level, and more boys than girls were found to have high PL. The study brings positive association between children's' PL, PAB, and physical wellbeing and the PAB has mediating role in the association between PL and physical wellbeing. In accordance with our hypothesis, we found that PL was positively associated with PAB and physical wellbeing.

6. Recommendation

School leaders, physical education teachers, coaches, and families should all play an important role in encouraging and fostering physical literacy in children. Further, well-being and PL competencies are the primary goal of schools in many countries. To advance knowledge in this area, additional empirical evidence regarding the connections between physical literacy, physical activity, and health is required in large sample.

Acknowledgments

The authors would like to express their gratitude to the school principals, physical education teachers, the participant children and their parents. The authors acknowledge the financial support provided by Debre Markos University.

References

Arbuckle, J. L. (2011). IBM SPSS Amos 20 user's guide. *Amos Development Corporation, SPSS Inc*, 226-229.

Barnett, L. M., Dudley, D. A., Telford, R. D., Lubans, D. R., Bryant, A. S., Roberts, W. M., Vella, S. A. (2019). Guidelines for the selection of physical literacy measures in physical education in Australia. *Journal of Teaching in Physical Education, 38* (2), 119-125.

Barnett, L. M., Lai, S. K., Veldman, S. L., Hardy, L. L., Cliff, D. P., Morgan, P. J., Ridgers, N. D. (2016). Correlates of gross motor competence in children and adolescents: a systematic review and meta-analysis. *Sports medicine, 46* (11), 1663-1688.

Barnett, L. M., Stodden, D., Cohen, K. E., Smith, J. J., Lubans, D. R., Lenoir, M., Dudley, D. (2016). Fundamental movement skills: An important focus. *Journal of Teaching in Physical Education, 35* (3), 219-225.

Barnett, L. M., Van Beurden, E., Morgan, P. J., Brooks, L. O., & Beard, J. R. (2009). Childhood motor skill proficiency as a predictor of adolescent physical activity. *Journal of adolescent health, 44* (3), 252-259.

Belanger, K., Barnes, J. D., Longmuir, P. E., Anderson, K. D., Bruner, B., Copeland, J. L., Lane, K. N. (2018). The relationship between physical literacy scores and adherence to Canadian physical activity and sedentary behaviour guidelines. *BMC public health, 18* (2), 1-9.

Cairney, J., Clark, H. J., James, M. E., Mitchell, D., Dudley, D. A., & Kriellaars, D. (2018). The preschool physical literacy assessment tool: testing a new physical literacy tool for the early years. *Frontiers in pediatrics, 6*, 138.

Cairney, J., Dudley, D., Kwan, M., Bulten, R., & Kriellaars, D. (2019). Physical literacy, physical activity and health: Toward an evidence-informed conceptual model. *Sports medicine, 49*(3), 371-383.

Caldwell, H. A., Di Cristofaro, N. A., Cairney, J., Bray, S. R., MacDonald, M. J., & Timmons, B. W. (2020). Physical literacy, physical activity, and health indicators in school-age children. *International Journal of Environmental Research and Public Health, 17* (15), 5367.

Carson, V., Tremblay, M. S., Chaput, J.-P., & Chastin, S. F. (2016). Associations between sleep duration, sedentary time, physical activity, and health indicators among Canadian children and youth using compositional analyses. *Applied Physiology,*

Nutrition, and Metabolism, 41(6), S294-S302.

Casas, F. (2011). Subjective social indicators and child and adolescent well-being. *Child Indicators Research, 4* (4), 555-575.

Colley, R. C., Carson, V., Garriguet, D., Janssen, I., Roberts, K. C., & Tremblay, M. S. (2017). *Physical activity of Canadian children and youth, 2007 to 2015*: Statistics Canada Ottawa, ON, Canada.

Delisle Nyström, C., Traversy, G., Barnes, J. D., Chaput, J.-P., Longmuir, P. E., & Tremblay, M. S. (2018). Associations between domains of physical literacy by weight status in 8-to 12-year-old Canadian children. *BMC Public Health, 18* (2), 1-8.

Doherty, B., Lee, J., Keller, J., & Zhang, T. (2019). Promoting school-aged children's physical literacy in schools: A brief review. *Journal of Teaching, Research, and Media in Kinesiology, 5*, 45-49.

Dong, X., Huang, F., Shi, X., Xu, M., Yan, Z., & Türegün, M. (2023). Mediation Impact of Physical Literacy and Activity Between Psychological Distress and Life Satisfaction Among College Students During COVID-19 Pandemic. *Sage Open, 13* (1), 21582440231162503. doi:10.1177/21582440231162503

Edwards, L. C., Bryant, A. S., Keegan, R. J., Morgan, K., & Jones, A. M. (2017). Definitions, foundations and associations of physical literacy: a systematic review. *Sports medicine, 47* (1), 113-126.

Elsborg, P., Heinze, C., Melby, P. S., Nielsen, G., Bentsen, P., & Ryom, K. (2021). Associations between previous sport and exercise experience and physical literacy elements among physically inactive Danes. *BMC Public Health, 21* (1), 1-10.

England, S. (2018). Active lives children and young people survey: academic year 2017/18. *Sport England: London, UK*, 1-48.

Hox, J. J., & Bechger, T. M. (1998). An introduction to structural equation modeling.

Ince, M. L. (2019). Supporting learning of practitioners and early career scholars in physical education and sports pedagogy. *Sport, Education and Society*.

Jess, M., Keay, J., & Carse, N. (2016). Primary physical education: A complex learning journey for children and teachers. *Sport, Education and Society, 21* (7), 1018-1035.

Kozera, T. R. (2017). Physical literacy in children and youth.

Lang, J. J., Chaput, J.-P., Longmuir, P. E., Barnes, J. D., Belanger, K., Tomkinson, G. R., Gregg, M. J. (2018). Cardiorespiratory fitness is associated with physical literacy in a large sample of Canadian children aged 8 to 12 years. *BMC Public Health, 18* (2), 1-13.

Logan, S. W., Kipling Webster, E., Getchell, N., Pfeiffer, K. A., & Robinson, L. E. (2015). Relationship between fundamental motor skill competence and physical activity during childhood and adolescence: a systematic review. *Kinesiology Review, 4*(4).

Longmuir, P. E., Boyer, C., Lloyd, M., Yang, Y., Boiarskaia, E., Zhu, W., & Tremblay, M. S. (2015). The Canadian assessment of physical literacy: methods for children in grades 4 to 6 (8 to 12 years). *BMC public health, 15* (1), 1-11.

Longmuir, P. E., Woodruff, S. J., Boyer, C., Lloyd, M., & Tremblay, M. S. (2018). Physical Literacy Knowledge Questionnaire: feasibility, validity, and reliability for Canadian children aged 8 to 12 years. *BMC public health, 18* (2), 1-11.

Lu, C., & Montague, B. (2016). Move to learn, learn to move: Prioritizing physical activity in early childhood education programming. *Early Childhood Education Journal, 44* (5), 409-417.

Lubans, D., Richards, J., Hillman, C., Faulkner, G., Beauchamp, M., Nilsson, M., Biddle, S. (2016). Physical activity for cognitive and mental health in youth: a systematic review of mechanisms. *Pediatrics, 138* (3).

Melby, P. S., Elsborg, P., Bentsen, P., & Nielsen, G. (2023). Cross-sectional associations between adolescents' physical literacy, sport and exercise participation, and wellbeing. *Frontiers in Public Health, 10*, 1054482.

Melby, P. S., Nielsen, G., Brønd, J. C., Tremblay, M. S., Bentsen, P., & Elsborg, P. (2022). Associations between children's physical literacy and well-being: is physical activity a mediator?

Nardi, P. M. (2003). *Doing survey research: A guide to quantitative research methods*: Allyn & Bacon.

Neuman, W. L. (2007). *Student workbook with data disc for" Basics of social research": qualitative and quantitative approaches*: Pearson.

Owen, K. B., Smith, J., Lubans, D. R., Ng, J. Y., & Lonsdale, C. (2014). Self-determined motivation and physical activity in children and adolescents: A systematic review and meta-analysis. *Preventive medicine, 67*, 270-279.

Poitras, V. J., Gray, C. E., Borghese, M. M., Carson, V., Chaput, J.-P., Janssen, I.,Kho, M. E. (2016). Systematic review of the relationships between objectively measured physical activity and health indicators in school-aged children and youth. *Applied physiology, nutrition, and metabolism, 41*(6), S197-S239.

Pot, N., Whitehead, M. E., & Durden-Myers, E. J. (2018). Physical literacy from philosophy to practice. *Journal of Teaching in Physical Education, 37* (3), 246-251.

Ravens-Sieberer, U., Auquier, P., Erhart, M., Gosch, A., Rajmil, L., Bruil, J., .

. . Czemy, L. (2007). The KIDSCREEN-27 quality of life measure for children and adolescents: psychometric results from a cross-cultural survey in 13 European countries. *Quality of Life Research, 16* (8), 1347-1356.

Robinson, D. B., & Randall, L. (2017). Marking physical literacy or missing the mark on physical literacy? A conceptual critique of Canada's physical literacy assessment instruments. *Measurement in physical education and exercise science, 21* (1), 40-55.

Roetert, E. P., Ellenbecker, T. S., & Kriellaars, D. (2018). Physical literacy: why should we embrace this construct? In (Vol. 52, pp. 1291-1292): BMJ Publishing Group Ltd and British Association of Sport and Exercise Medicine.

Rokholm, B., Baker, J. L., & Sørensen, T. I. A. (2010). The levelling off of the obesity epidemic since the year 1999–a review of evidence and perspectives. *Obesity reviews, 11* (12), 835-846.

Saint-Maurice, P. F., & Welk, G. J. (2015). Validity and calibration of the youth activity profile. *PloS one, 10* (12), e0143949.

Saunders, T. J., MacDonald, D. J., Copeland, J. L., Longmuir, P. E., Barnes, J. D., Belanger, K., Kolen, A. M. (2018). The relationship between sedentary behaviour and physical literacy in Canadian children: a cross-sectional analysis from the RBC-CAPL Learn to Play study. *BMC Public Health, 18* (2), 1-21.

Sport, W. I., & England, S. (2017). Key findings from girls active survey. *London, Women In Sport*.

Suskie, L. A. (1996). Questionnaire survey research: What works. 2nd ed, Association for Institutional Research, Tallahassee.

Tools, L. (2014). Physical literacy assessment in Canada. *Physical & Health Education Journal, 80* (1), 38-40.

Tremblay, M. S., Costas-Bradstreet, C., Barnes, J. D., Bartlett, B., Dampier, D., Lalonde, C., . . . Patton, R. (2018). Canada's physical literacy consensus statement: process and outcome. *BMC Public Health, 18* (2), 1-18.

Tremblay, M. S., Longmuir, P. E., Barnes, J. D., Belanger, K., Anderson, K. D., Bruner, B., . . . Hall, N. (2018). Physical literacy levels of Canadian children aged 8–12 years: Descriptive and normative results from the RBC Learn to Play–CAPL project. *BMC public health, 18* (2), 1-14.

Warburton, D. E., & Bredin, S. S. (2017). Health benefits of physical activity: a systematic review of current systematic reviews. *Current opinion in cardiology*, *32*(5), 541-556.

Whitehead, M. (2013). Definition of physical literacy and clarification of related issues. *ICSSPE Bulletin, 65* (1.2).

Whitehead, M. (2019). Definition of physical literacy: Developments and issues. In *Physical literacy across the world* (pp. 8-18): Routledge.

Whittaker, T. A. (2011). A Beginner's Guide to Structural Equation Modeling. In: Taylor & Francis.