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Understanding and Awareness of Physical Literacy by Early Childhood Educators in Hong Kong – a Mixed-Methods Study

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Abstract
In this study, we aimed to explore early childhood educators' conceptualisations of physical literacy and how these are integrated in their teaching practice. To this end, we used a mixed-methods embedded design, with a primarily qualitative component that is supported by quantitative data (QUAL + quan). Participants consisted of class teachers (n = 26), head teachers (n = 8), and principals (n = 11), who participated in interviews and responded to questionnaires. Qualitative data were examined using thematic analysis, and quantitative data were analysed using non-parametric statistics. Early childhood educators articulated an incomplete conceptualisation of physical literacy and reported low awareness of the concept. While the concept is relatively novel to early childhood teachers, integration of physical literacy in teaching practice was found to encompass the inter-related physical, affective, cognitive, and behavioural domains. Availability of resources, teacher training, education policies, family environment, and community environment were found to influence the development of physical literacy in early childhood settings. We recommend that education policies be reviewed, and systems-based support be provided to enhance teachers' capabilities, as well as family and community environments.

Keywords Physical literacy · Conceptualisation · Integration · Early childhood education · Educators

Introduction

The concept of physical literacy has gained increasing interest across the education and health sectors in the recent years. Physical literacy has been defined as the motivation, confidence, physical competence, knowledge and understanding to value and pursue physical activities across the lifespan (Whitehead, 2013; Dudley, 2015) further proposed that physical literacy is an umbrella concept that captures the knowledge, skills, understanding, and values related to taking responsibility for purposeful physical activity across the life course, regardless of constraints. It has been conceptualised as comprising four essential and interconnected domains: affective, physical, cognitive, and behavioural (Longmuir et al., 2015). The affective domain refers to motivation and confidence, while the physical domain refers to physical competence. The cognitive domain refers to having the knowledge and understanding of physical activities, while the behavioural domain is about participation in such physical activities. Thus, a physically literate child would likely participate in a variety of physical activities, as they could move competently and confidently, and understand the value of such participation.

The United Nations Educational, Scientific, and Cultural Organisation (UNESCO) has highlighted the importance of physical literacy to balanced child development, and emphasized that it should be supported during early years' education through deliberate policies (McLennan & Thompson, 2015). In a global environmental scan, ten countries (Australia, Canada, England, Ireland, Netherlands, New Zealand, Northern Ireland, Scotland, Venezuela, United States) were identified to have either explicitly developed physical literacy policies or implicitly incorporated physical literacy components into education and health programmes (Spengler, 2015). They also developed their own definitions of

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physical literacy. Of these countries, only Venezuela was a low-to-middle income country, with the rest categorised as high-income territories. Physical literacy was noted to be most well established in England, Wales, and Canada, where national governing bodies such as Sport England and Sport Canada delivered programmes alongside schools through physical education, community sports, or active play. While UNESCO highlights the importance of physical literacy-supportive policies for balanced child development, the main driver for countries with developed policies was the mitigating impact of physical literacy on rising health costs, underpinned by its relationship with physical activity. Recently, the World Health Organization (WHO) explicitly recognized that physical literacy is a key component of physical activity promotion (WHO, 2018a).

Adequate physical activity reduces the likelihood of non-communicable diseases such as hypertension, diabetes, depression, and thereby reduces health costs (WHO, 2018a). It also leads to improvements in fitness and energy balance, and so supports activities that contribute to child development. Over the last decade, growing evidence suggests that physical activity participation is positively associated with academic performance in children (de Greeff et al., 2018; Rasberry et al., 2011; McPherson et al., 2018). Physical activity patterns have been known to track from childhood to adulthood (Telama et al., 2014), and physical literacy has been argued to be an antecedent of physical activity participation (Edwards et al., 2017).

Early childhood has been suggested to be a critical period for the development of physical literacy (Buckler & Bredin, 2021), and early childhood education (ECE) settings have been identified as important contexts that can nurture physical literacy (Buckler et al., 2021). As participation of children in ECE has become a priority development goal with about 90% of children in developed regions attending pre-primary education (OECD, 2019), ECE settings represent a ubiquitous context for physical literacy development. In Hong Kong, for example, financial assistance is available to support children aged under six to attend pre-primary school (Education Bureau, 2020). In the latest figures, virtually all children aged three to five years in Hong Kong were enrolled in ECE centres (Government of Hong Kong SAR, 2021). Despite the potentially powerful role that ECE settings could play in promoting physical literacy, there is relatively limited research on the concept as it relates to ECE.

In contextualizing physical literacy, Castelli et al., (2015) noted that educators are responsible for creating the environment in which children can develop the physical, cognitive, affective and behavioural domains of physical literacy. Despite the apparent criticality of early childhood, there has been limited research on ECE teachers' knowledge and practices in relation to physical literacy. A recent review determined that very limited evidence has been published on physical literacy development in ECE settings and teachers' behaviours in relation to their ability to nurture physical literacy in young children (Lugossy et al., 2021). Nevertheless, the reviewed evidence suggested that teachers' personal interests and commitment to their own physical activity and health contributed to their confidence and ability to engage their pupils towards engaging in physical activity and developing physical literacy. Evidence from Canada has shown that ECE teachers tended to have a high general knowledge of physical activity but needed training to gain the competencies that are specific to physical literacy components (e.g., adapting skills instructions for children) (Buckler & Bredin, 2021). Similarly, a qualitative study in the United Kingdom revealed that ECE teachers needed training to address their limited understanding of the concept of physical literacy (Foulkes et al., 2020).

We note that physical literacy in ECE contexts has yet to be investigated in other territories, particularly where policies are less developed. In Hong Kong for instance, physical literacy has not been taken up in either education- or health-related policies, and ECE teachers' understanding of physical literacy has not been examined. Among the wider groups of educators, physical education teachers are perhaps most likely to have a good understanding of physical literacy. However, even physical education teachers have been found to have insufficient understanding and operationalisation of physical literacy (Harvey & Pill, 2019; Robinson et al., 2018; Stoddart & Humbert, 2017).

The potential for ECE settings to nurture physical literacy could be realised if teachers were equipped with adequate knowledge and skills to integrate the concept into their curriculum and instruction. As such, we need to know how well ECE teachers understand physical literacy and how it fits into their teaching practices. Despite the growth in global interest in physical literacy, we note that it continues to be relatively unexplored in the ECE context. Considering the relative novelty of physical literacy in ECE settings, this study aimed to explore ECE teachers' conceptualisation of, and experiences related to, physical literacy.

The primary research question asks: *What is ECE educators' conceptualisation of physical literacy, and how do they integrate it into their teaching practice?* A secondary research question asks: *What is the extent of ECE educators' current awareness of the concept of physical literacy*? We expect our findings to contribute to the global understanding of physical literacy in the ECE context. With the limited available research on physical literacy in the Asian region, we also expect to generate insights that will inform the directions towards supporting physical literacy and education policies in comparable territories.

Methodology

We used a QUAL + quan mixed-methods embedded design, the notation for which indicates that the qualitative component is of primary focus, and that the two methods are conducted simultaneously (Yardley & Bishop, 2017). We deemed this design appropriate as the qualitative and quantitative components address the distinct primary and secondary research questions (Creswell & Plano Clark, 2018). We took a one-phase approach where participants responded to pre- and post-interview questionnaires and participated in face-to-face interviews within one session. All procedures were approved by the university research ethics committee (Ref. no. 2018-2019-0352), and all participants provided informed consent prior to commencement of any procedure.

Participants and Setting

The participants consisted of ECE educators who work with children aged three to six years. Kindergartens in Hong Kong are registered with the Education Bureau, and provide nursery (K1), lower kindergarten (K2) and upper kindergarten (K3) classes (Education Bureau & Social Welfare Department, 2020). Classes typically last for three hours (half-day), but some whole-day classes are offered as a response to childcare needs. The participants came from nine kindergartens, with representation from each of the three main districts of the territory (i.e., three each from Hong Kong Island, Kowloon and New Territories). From each kindergarten, the participants included class teachers representing K1, K2, and K3 levels, head teachers representing middle management, and principals representing the leadership.

In total, there were 45 participants across the three categories, with 26 class teachers, 8 head teachers, and 11 principals. All participants were female with a mean age of 38.9 years (SD = 10.72 years), and an ECE experience of 17.5 years (SD = 10.70 years). ECE educators in Hong Kong are largely female dominated as evident in the 2019 data, which showed that 97.50% of ECE teachers were female (Census and Statistics Department, 2020).

Data Collection

Data generation included two primary sources: (1) questionnaires and (2) interview transcripts. The questionnaires were specifically developed for this research and used a five-point Likert scale, drawing from previous research that used such scales to assess aspects of physical literacy, such as confidence and knowledge, among parents and ECE teachers (Buckler & Bredin, 2021; Lane et al., 2021). The pre-interview questionnaire assessed participants' familiarity with physical literacy prior to any discussion with the researchers, and so represents their awareness of the concept, for example: *"How familiar are you with the concept of physical literacy? 1 – not familiar at all, 5 – very familiar*". The participants' demographic information was also gathered.

The post-interview questionnaire was used to follow-up on participants' perspectives after they had discussed the concept and definition of physical literacy with the researchers. As the interview had given participants information about physical literacy, we assessed the following: (1) participants' perceived importance of physical literacy to children's development, (2) frequency of desired and actual integration with the curriculum, (3) the need for teachers' professional development support, and (4) perceived personal level of physical literacy. The participants completed the questionnaires individually, by pen and paper, during 10-min periods before and after the interviews.

Twenty-nine face-to-face interviews were conducted, of which eight were conducted in groups for class teachers, with two to three teachers per group; 21 were conducted individually with head teachers, principals, and class teachers unable to join group interviews due to scheduling constraints. Group interviews lasted between 35 and 45 min; individual interviews lasted between 25 and 30 min. A semi-structured guide queried participants' (1) understanding of the concept of physical literacy, (2) integration of physical literacy in their teaching practice, and (3) reflections on the factors that influence practices related to physical literacy. The first point of query was followed by a discussion of the definition of physical literacy. The subsequent two query points were raised after the concept of physical literacy had been clarified and defined for the participants. The interview questions were open-ended and exploratory. All interviews were conducted in the participants' native language, with 28 interviews conducted in Cantonese and 1 interview in English. The researchers found no official translation of the term "physical literacy" to Cantonese, and therefore used the English term since all Cantonese-speaking participants were bilingual. Audio of the interviews was recorded and transcribed verbatim. The accuracy of the transcriptions was verified through member checking (Creswell & Plano Clark, 2018).

Data Analysis

To obtain a rich and representative description of the understanding of physical literacy in this sample, we adopted a pragmatic framework, which positions the inquiry in the context of the participants' experiences (Yardley & Bishop, 2017). A pragmatic framework is also consistent with the combination of qualitative (i.e., primary) and quantitative

Table 1 Summary of themes, codes, and example quotes that represent the participants' conceptualisation of physical literacy

Themes	Codes	Example Quotes
Physical literacy is about promoting physical development and health	• Physical strength	"It relates to physical development, physical ability, and to do with strength." (CT24)
	• Body weight	"This term refers to the weight of your body, that is up to the standard" (P02)
	• Diet and nutrition	"Physical literacy is related to the growth of children, and the nutrition they need." (CT14)
	• Health-related fitness	"Probably it is talking about physical fitness, or our understanding of it." (HT05)
	• Exercise and/or sports	"I guess it should be similar to, or related to sports… how to do some body actions or activities." (HT09)
Physical literacy involves values development	• Character development	"It includes personal character. For example, it can include politeness, which is developed and not just their innate character." (P08)
	• Attitudes to peers	"It should mean in addition to physical fitness, physical literacy includes developing attitudes to other children." (P04)
Physical literacy relates to communication	• Verbal expression of knowledge	"It includes understanding physical development through language… for example, expressing the definition of physical activity." (P07)
	• Communication through body language	"It should involve displaying natural expression of emotions through movement." (P03)

(i.e., supportive) methods to answer the research questions set out in this study.

For the qualitative component, the transcriptions of the interviews in the native language were examined using thematic analysis. A total of 28 transcripts were written in Chinese, and one transcript was written in English. An inductive (i.e., bottom-up approach) approach was taken, where the researchers interpreted the meanings of the participants' responses (Terry et al., 2017). The analytic process consisted of the following phases: familiarising with the data, generating codes, generating initial themes, reviewing and developing themes, and refining, defining, and naming themes (Clarke & Braun, 2021). Data familiarisation was guided by the lines of inquiry of the semi-structured interview guide, where two bi-lingual members of the research team read the transcripts in detail. Generation of codes was conducted separately for the three participant groups (i.e., class teachers, head teachers, principals) because it was believed that their functions would differentiate their experiences. Codes were drafted, discussed, and finalised over three discussion sessions by the research team. After all transcripts were coded, initial themes were generated for each participant group. This was followed by an iterative process of reviewing, developing, and refining the themes. The transcripts, codes, and themes were translated to English from Chinese after the analysis was completed, except for the English transcript.

For the quantitative component, background data obtained from the questionnaires were analysed using descriptive statistics (presented in the participants' section above). Responses to the scales were analysed and compared between participant groups using non-parametric Chi-square and Kruskal-Wallis tests after considering the relatively small sample size for quantitative analysis (Dwivedi et al., 2017). Significance was set at $p < 0.05$.

A composite approach was taken to integrate the findings from the qualitative and quantitative analyses, where the distinction between the two analytical methods were preserved, and subsequently integrated to generate complementary insights (Yardley & Bishop, 2017) to answer our research questions.

Results

The ECE educators' insights in relation to physical literacy are presented here under three areas of inquiry: conceptualisation of physical literacy, integration of physical literacy in their teaching practice, and factors that influence practices related to physical literacy. The themes are discussed under each area, and are summarised in Tables 1, 2 and 3, including the corresponding codes and example quotes. When quotes are presented, participant attribution is reported according to the participant numbers (e.g., CT01-Class Teacher 01, HT01-Head Teacher 01, P01-Principal 01).

Conceptualisation of Physical Literacy

Three themes were found to represent the participants' conceptualisations of physical literacy: *physical development and health, values development*, and *communication.*

Physical Literacy is About Promoting Physical Development and Health

The dominant theme from participants' responses was that physical literacy of young children is about their *physical*

Table 2 Summary of themes, codes, and example quotes that represent the ways that participants integrate physical literacy to their teaching practice

Themes	Codes	Example Quotes
Physical literacy is integrated through training of motor skills	• Gross motor skills	"In addition to going out to play, we ensure that every day there will be physical activates… gymnastics including balance, climbing, and a lot of gross motor skills" (P08)
	• Intentional ball skills practice	"The most basic thing is hitting balls – how they hit, they need to control the strength to hit the ball to make it bounce back to a certain height." (CT23)
	• Unstructured free play	"We allocate free play time for children. They can freely choose a slide or a scaffold; or climb up and down. Sometimes they may play with beanbags. During the process, they can learn from it, and physical fitness improves." (CT16)
Physical literacy is integrated by teaching health-related knowledge	• Healthy eating	"They will have refreshments every day in the snack time, and they will try different kinds of food. The teachers will tell them not to eat junk food. We teach about good diet." (P02)
	• Hydration	"In our learning units, we teach them how to be healthy, drink more water." (CT08)
	• Importance of exercise	"In the lessons, we mention how exercise trains up different parts of the body. That exercise makes one stronger, so you could move better." (CT10)
Physical literacy is integrated in daily routines	• Morning routines	"I guess having a timetable enables it. You know, have the time every morning to do some kind of physical activity or exercise." (CT20)
	• Scheduled physical games	"Basically, we will let them to do physical play every day. That is, going to the game room and getting the opportunity to move. All these would cultivate a routine that every day they have to exercise and not just sit down." (CT21)
Integrating physical literacy involves developing motivation and affect	• Habit formation	"I think the habit will be developed when children are having fun, and they would ask their parents to accompany them with physical activities when back home. Kids may always ask mommy or other family members to go out and do it again." (CT14)
	• Positive experience	"Some students may feel like they cannot do physical activity. Like with other activities, we try to teach children in the growth mindset. They learn to value the effort that they put in rather than the being the best in the class." (CT20)
	• Social participation	"We will let them try to choose the equipment to work on, and then do some physical activities. This may help focus on the social experiences and they will keep engaged." (HT04)
Physical literacy is integrated when the curriculum abides by the government regulations	• Education bureau guidelines	"We follow the guidance of the Education Bureau to arrange our curriculum… like the learning areas include physical fitness. That's how we know we are in the right path even though we cannot do it perfectly." (P03)
	• Balanced child development	"Our school will definitely have physical activities every day because we follow the Education Bureau's guidelines of doing exercise to achieve balanced development." (HT04)
	• Curriculum learning areas	"Hong Kong has started to pay attention to doing sports and fitness… The Education Bureau curriculum guidelines actually requires us to include daily exercise and physical fitness in our schedule. This is how we integrate physical literacy." (P10)

development and health. From class teachers, this theme was developed from codes that related physical literacy to children gaining developmentally appropriate physical strength and body weight, and having overall health-related fitness. From head teachers and principals, the codes further linked physical literacy with nutrition and diet, and participation in exercise, sports, and physical activities.

Physical Literacy Involves Values Development

A second theme evident from the responses of head teachers and principals was that physical literacy is also about young children's *development of values*. This theme included responses that referred to character development, where principals suggested that the concept could relate to how children learn to be polite and respectful, and to be inclined towards lifelong learning. It appeared that they tended to interpret that the term literally – i.e., it is a form of literacy (learning). Another code within this theme is related to

Table 3 Summary of themes, codes, and example quotes that represent the factors that influence practices related to physical literacy in early childhood

Themes	Codes	Example Quotes
Physical literacy integration is influenced by the availability of resources	• Equipment	"Sometimes we want to do some special activities but may need equipment that the school cannot provide… or we need some huge equipment, but we cannot borrow from the community." (CT26)
	• Teaching materials	"We get new information, but you know sometimes we are not so clear on some concept. If you have some teaching kit… Through a teaching kit, the teachers can get information about lesson plans to implement in the classroom." (P01)
	• Space for play and exercise	"We have limited space. Maybe too little outdoors. Children have little space to do exercise." (CT05)
	• Community facilities	"If the size of the school is not big, and no open spaces, we try to solve it. We rent a sports field or an outdoor basketball court, or even borrow from the housing estate. To be honest, many school spaces are not ideal, so we have to rely on community resources." (HT09)
	• Supply chain	"The available equipment is not sufficient. We were looking for gymnastic equipment that were designed for early years. But we could only find them from suppliers in foreign countries and could not get them from here." (P07)
Teacher training is needed to integrate physical literacy	• Professional development activities	"Actually, most teachers like us finished our studies with little focus on physical education, fitness, or some skills. We are not sure the way to teach fitness. Maybe, it is the best to have some relevant experts to provide us training first." (CT22)
	• Limited knowledge of concepts	"The teacher's knowledge is very important. Like physical fitness, teachers need to take some courses to learn it." (CT26)
	• Curricular design strategies	"Teacher training – that relates to the professional knowledge of teachers. Can there be trainings to show us how to integrate physical literacy into our curriculum?" (HT01)
	• Teachers' own physical literacy	"There are many teachers who have grown up may have forgotten how to do active play. We can either bring in some professional to do it, or help the teachers learn again to play." (P10)
Physical literacy integration is dependent on the education policies	• Clarity of objectives for learning areas	"Could there be an indicator, for example, the skills set that are appropriate for different age groups? A course guideline for schools, specific to physical fitness will be good to integrate physical literacy in our curriculum." (CT23)
	• Implementation guide for policies	"Hong Kong's education system is too focused on academics. They want children to play, but there is no time for that. For example, the EDB said that we do not need to focus on academics; but they do not lower the level the primary school expectations. We have to focus on academics, otherwise our students cannot catch up the primary school curriculum." (CT10)
	• Inconsistency of cross-level guidelines	"The government actually launched a free play policy, but it just mentions that there should be a time for students to free play. I think that is too flexible. How much time actually?" (HT04)
The family environment influences physical literacy development	• Parents' beliefs	"Parents expect their kids to learn a lot in schools and teachers have to fulfil this expectation. The children needed to learn Chinese and mathematics, and parents feel that it is not important to do sports or physical activities." (CT20)
	• Family priorities and routines	"In fact, we notice that some children are unstable when they walk up the stairs. Why is it unstable? Many parents carry the children too much, and children have less opportunity to walk. I have a two-year-old pupil and she cannot climb up three-step stairs. Many parents still use a baby stroller, instead of letting children walk." (P08)
	• Safety concerns	"Kids really want to play, but there are a lot of rules for them. For example, if they want to climb higher or run further, their parents will ask them to be careful because they worry about safety. Parents' reminders tend to limit the kids." (CT18)
	• Socio-economic status	"Working class parents have to work. Often, they have no time to do exercise or play with their kids because they are really tired after work." (CT12)
The community environment influences the school prioritisation for physical literacy	• Social values	"We take the responsibility of children's safety, and we are actually very cautious. If our society or parents are open-minded, it will not be a big deal for children to have small injuries. We have to develop this mindset first. Otherwise, we keep having some reservations when we play with children." (CT18)
	• Culture	"In fact, it is the culture. Outside the school, it all depends on their family. We can prioritize physical literacy. But even if families and the school are doing it together, but the general community does not have this atmosphere, it won't be successful." (P04)
	• Public knowledge of the concept of physical literacy	"We need to let everyone understand that cultivating physical literacy is important for people. It is important for children's growth – this can help in many aspects. When the public understands it, it will be easier for schools to implement it." (P02)

children's attitudes to their peers, which include responses about behaviours that support, motivate, or encourage others.

Physical Literacy Relates to Communication

A theme that was unique among the principals is that of

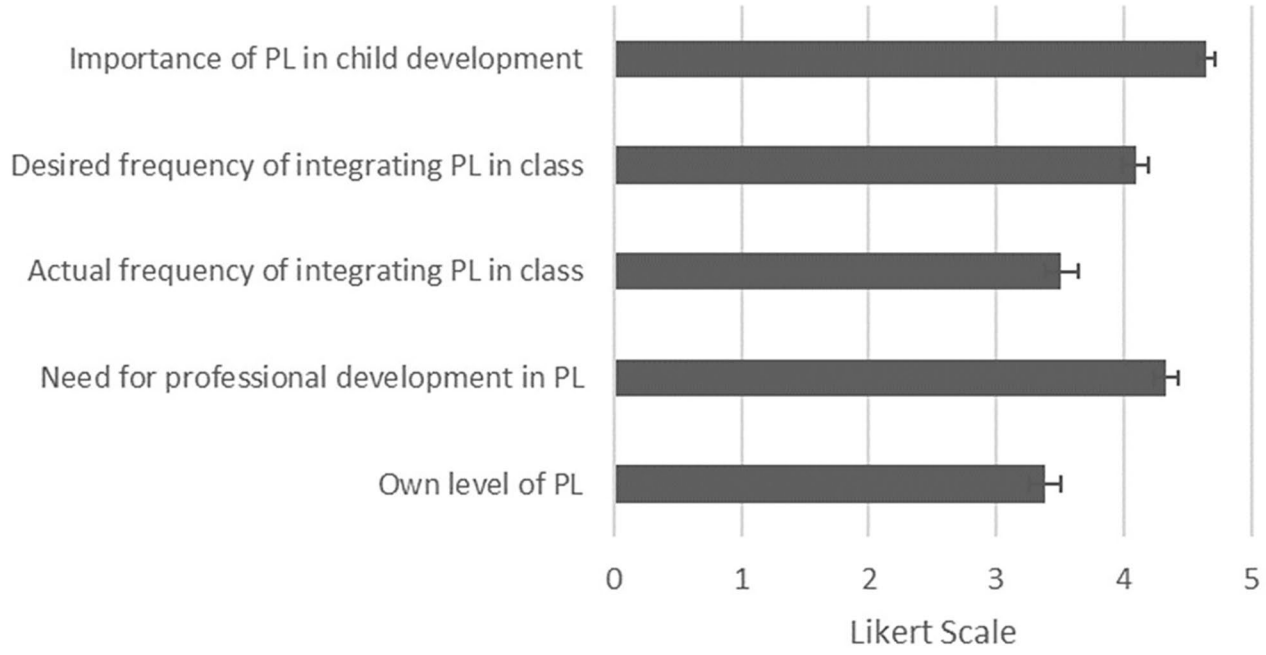

Fig. 1 Participants' perceptions related to physical literacy (PL) post-interviews

physical literacy being related to the *development of communication*. This theme includes responses that were coded as verbal expression of knowledge. Being physically literate was thought to encompass having a verbal understanding of the importance of physical activities. Physical literacy was also conceptualised to involve children's ability use their body to learn language, and use movements as a form of expression.

It is important to note that in describing their conceptualisation of physical literacy, most class teachers displayed uncertainty or hesitation. For instance, most responses began with phrases such as "I am assuming…[CT20]" or "I am thinking it might be…[CT12]". In several interviews, class teachers acknowledged that they did not know about the concept of physical literacy at all, for example "I do not know the exact meaning of it [CT21]", "I have not heard of this term before [CT03]". Head teachers and principals appeared to be less uncertain. Only one head teacher directly acknowledged not having a knowledge of physical literacy; one principal reported limited familiarity and described their conceptualisation as superficial.

Integrating Physical Literacy in the ECE Teaching Practice

Following a discussion of the definition and components of physical literacy by the researchers, the participants described how they thought they were integrating the concept in their respective practices. The participants appeared to believe that physical literacy was not adequately integrated in the local curricula, and this is consistent with findings from the post-interview questionnaire reported in the latter part of this paper. Nevertheless, the following themes reflected the participants' descriptions of how they integrated the concept into their teaching practice: *training motor skills, teaching health-related knowledge, implementing daily exercise time, developing motivation and affect*, and *abiding by government regulations*.

Physical Literacy is Integrated Through Training of Motor Skills

This theme was widely discussed among class teachers and included responses that were coded according to the nature of the intended training – gross motor skills, ball skills practice, or unstructured free play. The participants noted that these training activities were consistent with the local expectations that fundamental movement skills (i.e., gross motor [locomotor, manipulative], stability) should be trained in pre-primary school settings. The teachers reported that specific skills (e.g., striking balls, balancing) were trained through both structured practice sessions and unstructured free play. Occasionally, homework was also given so that children would have practiced their movement skills at home with their parents.

Physical Literacy is Integrated by Teaching Health-Related Knowledge

The class teachers reported that physical literacy was integrated through learning activities that taught *health-related knowledge*. This theme included ideas and concepts which were coded as healthy eating, hydration, or the importance of exercise for the body. The class teachers noted that such knowledge would have helped children understand what happens to their bodies when they exercise and the benefits that they gain when they do it regularly.

Physical Literacy is Integrated in Daily Routines

The class teachers and head teachers described activities where physical literacy appeared to be integrated through daily routines. The participants reported that they were able to incorporate some form of daily exercise or physical games into their scheduled routines, such as every morning before lessons start. They deemed such activities to be a regular way of facilitating physical literacy.

Integrating Physical Literacy Involves Developing Motivation and Affect

This theme related to the respondents' views that when they attempt to integrate physical literacy into their teaching practices, it involves conscious effort to promote not only physical fitness but also motivation and positive affect. Responses that discussed routines to cultivate activity patterns that extend and persist beyond the school context were coded under habit formation. The teachers also discussed that children's motivation is enhanced by positive experiences of movements (e.g., when it is fun, when children get to choose, and when it is not competitive) and with opportunities for children to engage in positive social interactions with each other.

Physical Literacy is Integrated When the Curriculum Abides by the Government Regulations

The final theme is mainly from the responses of head teachers and principals, who as administrators thought that they ostensibly integrated physical literacy by following government regulations. Responses that referred to the guidelines of the Hong Kong Education Bureau brought up the required 30 min of free play or daily physical activities. Other responses were coded as references to balanced child development, following recommended physical skills according to age. The participants also discussed the stipulated learning areas by the government regulations, which included health and physical fitness.

Factors that Influence Practices Related to Physical Literacy in Early Childhood

The participants' reflections on the factors that influenced practices related to physical literacy in early childhood revealed the following themes: *resources, teacher training, education policy, family environment*, and *community environment.*

Resources

This theme was the most discussed across all participant groups and appeared to be the most significant factor for the principals. This theme refers to the availability of resources needed to promote physical literacy in ECE settings. The responses were coded as equipment, teaching materials, spaces for play and exercise, community facilities, and access to suppliers. According to the class teachers, resources were largely limited in local ECE centres (i.e., government-subsidised) which made physical activities difficult to implement. Sets of play equipment, when available, tended to be old and inadequate. Apart from the limited funding to purchase equipment, the principals also noted that most of the equipment for physical activities was designed for youths and adults. Equipment specifically designed for young children were typically accessible only through overseas sources. The additional costs of overseas purchasing made it harder for principals to utilise limited funding efficiently.

Some kindergartens were near to community spaces with play equipment. However, the class teachers perceived these spaces to lack diversity (e.g., "you will find the same things in every playground [CT06]"), and did not allow much exploration of risks by children. Play equipment in community spaces were also perceived to be less suitable for younger children (e.g., "those playgrounds are for primary school children [CT26]"). From the principals' perspective, long-term bookings of community spaces such as specific days every week throughout the school terms could possibly allow kindergartens to re-design the spaces to suit young children. Constrained physical space in the ECE settings was also perceived to contribute to the lack of diversity in their own equipment and materials. Across all participant groups, it was noted that even if kindergartens were able to buy equipment and materials, they would not have the space to store or set them up. Ultimately, lack of space was believed to limit the kinds of activities that the teachers could conduct to integrate physical literacy in their teaching practice. The teachers expressed that adequate and suitable spaces would likely help to motivate children to engage in physical activities. However, it was widely acknowledged

that space was generally a scarce resource in Hong Kong even outside of education settings.

Teaching materials for teachers were also mentioned as resources that could potentially enable integration of physical literacy, but these were currently unavailable. These were described to include samples of activities to promote physical literacy, and models of ECE curricula that integrate physical literacy. Teaching kits designed to suit the levels in the local ECE system (i.e., K1 to K3) and in Chinese language were extremely limited ("current information is mainly in English and it is difficult for teachers to understand [P07]").

Teacher Training

This theme refers to the need to support teachers in integrating physical literacy into their curricula. The forms of support varied, and were coded as professional development activities, knowledge of concepts, curricular design strategies, and teachers' own physical literacy. Short courses, workshops, and on-site seminars were mentioned as forms of professional development. The principals in particular acknowledged that the concept of physical literacy is beyond the current knowledge base of ECE teachers. Head teachers noted that specific knowledge of physical fitness and sports training needs to be improved. However, the class teachers' point of view was that there is a greater need for support to design strategies that integrate physical literacy in different learning areas. This was echoed by the principals, who said that teacher training should be more practical and experiential. Class teachers also noted that they need to design activities for small spaces.

All participant groups acknowledged that their own physical literacy (i.e., their own knowledge, skills, attitudes and motivation for physical activity) is a factor that influences the engagement that they can model when conducting physical activities. The principals specifically noted that many teachers were not motivated to participate in physical play themselves, and their own habits needed to improve. In the longer-term, the principals believed that pre-service teacher preparation should promote teachers' own physical literacy, for it to be an enabling factor for integration of physical literacy in ECE practice.

Education Policy

This theme refers to current local education guidelines, which have a significant impact on the extent that teachers prioritize physical literacy. The responses were coded according to learning area objectives, implementation of policies, and inconsistency of guidelines across school levels (i.e., kindergarten, primary, secondary). The class teachers noted that learning objectives in other learning areas, such as language or maths, were clear. However, this was not the case for physical literacy, where they were unaware of specific guidelines for different age groups, and they did not know of indicators to signal that children were tracking well to become physically literate. There was a perceived lack of specificity in the government policies, where the educators' interpretations varied widely. For example, whilst there is a policy requiring 30 min of free play daily, this was deemed insufficient to promote physical literacy because it could be interpreted flexibly such that they may not entail physical activity at times (e.g., sedentary activities during free play).

Education guidelines across the school levels were reportedly inconsistent. For instance, balanced development was espoused in the ECE curriculum guide but there remained a heavy focus on academic achievements. According to the principals, the current policy had led to ECE curricula with tight schedules that did not give space for physical activities, sports, or active play. For the class teachers, the impact of the inconsistent education policy on time was more pervasive than the availability of resources. The academic focus of the curriculum guidelines in the primary school system was heightened, which ultimately influenced ECE teachers' priorities. Finally, the principals and teachers noted that the teacher-student ratio in local kindergartens did not allay teachers' concerns about safety when engaging in physical play.

Family Environment

This theme related to parents' beliefs, priorities, and concerns, which according to the teachers, affects the development of physical literacy. Across participants, the family environment was believed to influence the disposition of the child. It was discussed that parents would often worry about safety and injuries to the extent that they limited outdoor play. Such concerns reportedly influenced ECE teachers to limit physical play to avoid blame should injuries occur. However, the teachers noted that the children who were prone to getting injured at school were those whose parents did not engage with them in physical play at home. Related to this, some responses were coded under family socio-economic status, because working class parents in Hong Kong often had limited time for physical play with their children.

According to class teachers, most parents in Hong Kong tended to prioritise activities that were deemed valuable to academic performance (e.g., "parents think that children do not need to do non-academic activities [CT13]"). Some parents also believed that young children did not need the associated health benefits of physical activities. As such, the class teachers observed that when physical activities were designed for parents and children to work together, the

participation rate of parents was often low. Moreover, the Hong Kong context often involved carers other than the parents, such as grandparents or domestic helpers, who make up another group of contributors that need to be considered in the family environment.

Community Environment

The last theme refers to aspects of the local community that participants thought could influence the way physical literacy is promoted in early childhood. The participants' responses were coded to refer to social values, local culture, and public knowledge of physical literacy. It was frequently remarked upon that Hong Kong society places a high value on leading children to sit down and learn academic subjects, and that this is contrary to promoting physical activities. The participants also discussed that while the local culture was increasingly more conscious of health, sporting culture was still weak. As such, it would be difficult to promote physical literacy even if there were a partnership between the school and families. The participants also thought that public knowledge needed to be addressed to enable physical literacy promotion in early childhood. It was proposed that if the concept of physical literacy was understood by the public, the ECE sector could allocate time and resources for it with the support of parents and the wider community.

Awareness of the Physical Literacy Concept

Prior to the interviews, a small portion of the participants (31%) reported that they had some level of familiarity with the concept of physical literacy ($X^2 = 6.42$, df = 1, p = 0.01). On the five-point scale, where higher scores reflect higher familiarity with the concept, the mean rating was 2.22 (SD = 0.85). There were no significant differences between the participant groups (H = 1.80, df = 2, p = 0.41). These were consistent with the findings discussed above, where the participants appeared to be highly uncertain when discussing the concept.

Valuing Physical Literacy

Following the discussions of physical literacy, the participants' rating of the frequency with which they actually integrated physical literacy into their teaching practices (M = 3.51, SD = 0.87) was lower than the frequency that they desired (M = 4.09, SD = 0.70). The importance of physical literacy to child development was rated with a mean of 4.64 (SD = 0.48), while the need for professional development support was rated with a mean of 4.33 (SD = 0.64). The participants also rated their own personal level of physical literacy, and the mean was 3.38 (SD = 0.83). There were no significant differences in the ratings given by the participant groups. However, the teachers' rated the actual frequency of integrating physical literacy in their teaching practices lower than the principals and head teachers, with the difference approaching significance (H = 5.99, df = 2, p = 0.05).

Discussion

Given the conclusive evidence supporting the benefits associated with physical activity participation across the lifespan (WHO, 2018a), the importance of physical literacy in early childhood needs to be highlighted. ECE centres are important settings where physical literacy can be nurtured, but this is reliant on the educators' ability to address the concept in their curricula. In this research, we explored the ECE educators' conceptualisation of physical literacy, how they operationalise it in their teaching practice, and the perceived factors that influenced practices. We also assessed the current levels of educators' awareness of the concept, and their perceptions that are relevant for future actions.

ECE Educators' Understanding of Physical Literacy

We engaged with educators who have distinct roles in the typical ECE settings in Hong Kong: frontline classroom teachers, head teachers who are middle leaders and principals who lead the centres. From our quantitative data, it appears that there is low awareness of the concept of physical literacy across the participants, with less than a third aware of the concept of physical literacy prior to any discussion. Participants' level of familiarity was also rated below the mid-point of the scale. This is consistent with the teachers' responses that displayed uncertainty when explaining what they thought the concept was about.

Physical literacy consists of the inter-related physical (physical competence), affective (motivation and confidence), cognitive (knowledge and understanding), and behavioural (PA engagement) domains (Longmuir et al., 2015). The three themes that describe our participants' conceptualisation of physical literacy appear to encompass the physical and behavioural (i.e., physical development and growth), affective (i.e., motivation and affect), and cognitive (i.e., communication) domains. We note, however, the cognitive domain appears to be a relevant aspect of the physical literacy concept only for the principals. The class and head teachers conceptualised physical literacy to consist only of the physical, behavioural, and affective domains. Integrated with our quantitative assessment of the educators' awareness of the concept, our composite analysis suggests that early childhood educators' explicit understanding of physical literacy needs to be strengthened – especially among the

frontline teachers. Otherwise, such incomplete understanding of physical literacy by ECE teachers will likely constrain how it can be integrated into their practice. Supportive training for teachers was identified as an enabling factor for physical literacy promotion, and the need for it was verified by the participants' rating, which is at the higher end of the rating scale. This need for professional development is perhaps not surprising considering the broad range of literacies (e.g., numeracy, reading, and writing) that early childhood educators need to cover, and the relative novelty of the concept of physical literacy. In other work, even leaders in the field of physical education have been unable to fully articulate conceptualisations of physical literacy (Robinson et al., 2018). Across the education specialisms, significant work seems needed to facilitate a comprehensive conceptualisation that would enable teachers to integrate physical literacy effectively in their teaching practice.

Despite the incomplete articulation of the concept, participants' practices appeared to integrate the physical (i.e., training of motor skills), affective (i.e., developing motivation and affect), cognitive (i.e., health-related knowledge), and behavioural (i.e., daily routines) domains of physical literacy. Moreover, it was apparent from the participants' accounts that their practices reflect the inter-related nature of the physical literacy domains. For instance, class teachers discussed that exercise routines (behavioural) were implemented to facilitate children's motivation (affective) to be active. This runs contrary to the perceptions of physical education teachers, who reportedly equated physical literacy to fundamental movement skills competence (Robinson et al., 2018). It is possible that the broad child development concerns of early childhood educators work in favour of a more holistic integration of physical literacy to their curricula.

Enabling Physical Literacy in Early Childhood Settings: Focus on Policy

Substantial research in physical literacy has focused on refining its conceptualisation and philosophical underpinnings (Bailey, 2020; Shortt et al., 2019), developing assessment frameworks (Goss et al., 2021; Shearer et al., 2021), and identifying implications for teacher education (Durden-Myers & Keegan, 2019; Edwards et al., 2019). In terms of integrating physical literacy into educators' teaching practices, there is little empirical evidence on any enabling or challenging factors in varying contexts. In this study, we identified five factors that need to be considered in ECE settings.

Space, equipment, and material resources were the most frequently discussed factors across participants. These factors were discussed largely in relation to their limiting effect on setting up activities that targeted the physical and behavioural domains of physical literacy. While these factors were identified in context of the local experiences of the participants, similar experiences have been discussed elsewhere in the world. For instance, a recent study in Australia identified the same factors as obstacles to the provision of classroom-based physical activity (Macdonald et al., 2020), which relates to the behavioural domain. A recent systematic review also determined that lack of resources and space are barriers to the integration of movement activities in primary school classrooms (Michael et al., 2019). Our participants identified using community spaces and facilities as a potential solution to the lack of space, but this appears to be largely unsuitable for young children. A long-term approach to mitigating these barriers would require policy changes in relation to the development and design of community facilities. Improved design of space and equipment to suit young children would not only enable educators' efforts to nurture physical literacy but would also promote physical activity participation during non-school hours (Escalante et al., 2014). To this end, the *ACTIVE* policy toolkit by the WHO (2018b) could guide public agencies improve access to public community spaces that enable children to engage in physical pursuits.

The factors that relate to education policies, family environment, and community environment are all systems-level issues. While many teachers focused on the need for clear guidelines that would help them integrate physical literacy in their curricula, the impact of the current education policy on tight scheduling and prioritisation were also brought up. Time is the crucial limiting factor for class teachers as they attempt to meet the local education regulations. Essentially, guidelines directing teaching practice and policies across school levels were intertwined (i.e., primary school policy affects ECE pupils transitioning from kindergarten). For physical literacy to be integrated in ECE, it seems essential that Hong Kong education policies be reviewed in relation to the expected competencies of children upon entering primary school. Elsewhere, the need to review education policy was also highlighted in Australia, where it was recently suggested that policies (i.e., physical education curriculum) could be aligned with the concept of physical literacy (Scott et al., 2021).

Conceptually, physical literacy can be viewed as an antecedent to physical activity participation (Young et al., 2020). As such, operationalising physical literacy in ECE is linked to the creation of opportunities for children to participate in physical activities. Globally, policy level interventions are suggested to be effective in promoting physical activity, including "whole of school investments" which target all members of the school community through supportive policies (Milton et al., 2021). Such policy-driven approaches should be considered when reviewing education policies.

Systems-based changes on policies can also address issues for the wider community (Milton et al., 2021). The principals noted that if the wider community appreciated the benefits of physical literacy, kindergartens could have support for nurturing physical literacy through their curricula. The Hong Kong society has been known to prioritise academic achievements as a means to achieving a desirable social status (Pang, 2014). This is deeply rooted in Confucian culture, which influences the physical pursuits of children and families (Capio & Sit, 2021). It is therefore not surprising that the family environment presents challenges related to parental dispositions, and limits the impact kindergartens can make in nurturing physical literacy. That the participants in this study appear to recognise the constraining role of the family environment in physical literacy development is an indicator of an ongoing shift in perspective. Presumably, as early childhood educators become increasingly knowledgeable of the physical literacy concept, they will continue to recognise that their current practice is inadequate, i.e., that the frequency of actual integration is lower than the desired frequency of integration. Now is the time to pursue strategies that would disseminate knowledge of physical literacy to parents and the wider community.

Strengths and Limitations of the Study

We focused on the relatively unexplored understanding of physical literacy by early childhood educators. Consistent with our pragmatic approach to this study, we drew our conclusions from the participants' descriptions of their experiences (Yardley & Bishop, 2017). By exploring the way physical literacy is integrated in teaching practice, we were able to get a rich sense of the educators' understanding of the concept (Young et al., 2020) beyond what they explicitly articulated. Given the nature of our inquiry, we caution that the findings should be viewed in the context of the local environment. Nevertheless, the factors that were found to affect physical literacy practice in early childhood education are likely to be relevant in other territories. We further note that our participants reported low awareness of physical literacy prior to the interviews, but further research is needed to verify whether this reflects the awareness of ECE educators across the territory. The participants also rated their own physical literacy to be moderate, and future work is recommended to better evaluate this issue. We propose that this is an important future direction because teachers' own disposition for physical engagements tend to contribute to their ability to promote physical literacy in their pupils (Lugossy et al., 2021).

Conclusion

This study revealed that early childhood educators articulated an incomplete conceptualisation of physical literacy and reported low awareness of it. However, it appears that integration of physical literacy in ECE teaching practice encompasses the inter-related domains. To enable ECE settings to nurture physical literacy, education policies need to be reviewed. Moreover, systemic support should be provided to improve teachers' ability to practice and promote physical activity, encourage families to prioritise children's active pursuits, and advance the society's understanding of physical literacy.

Author's Contribution Capio C.M. and Ho D.C.W. developed the study conception and design; Ho H.C.M. and Chan C.C.Y. performed the data collection; Capio C.M., Ho H.C.M. and Chan C.C.Y. performed the analysis; Capio C.M. wrote the first draft of the manuscript and all authors contributed to revisions; all authors approved the final manuscript.

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Declarations

Competing Interests The authors have no competing interests to declare that are relevant to the content of this manuscript.

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