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Exploring the Causal Effects of Outdoor Play on School Readiness of Preschoolers in the Klang Valley, Malaysia

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Abstract: According to research, preschool physical environments (PPE) that promote outdoor play have a positive impact on children's overall wellbeing, as well as their total developmental competence and academic learning, which then directly affects their school readiness prior to entering primary school. This study analyses the causative impacts of outdoor play on preschoolers' school readiness for primary school in Klang Valley, Malaysia. Additionally, we attempted to extend a prior research conceptual model on outdoor play in studying the link between PPE and preschoolers' school readiness. From June to August 2022, 84 private preschool operators from the Klang Valley took part in the survey to offer their viewpoints; however, only 72 completed questionnaires could be used for PLS-SEM analysis using SmartPLS 4. It has been discovered that outdoor play does, in fact, have a favorable, considerable impact on academic learning and school readiness. Other findings offer more proof of the causal links between outdoor play and children's development. Important stakeholders, such as preschool providers, preschool designers, preschool educators, as well as parents, should make sure that appropriate outdoor play yards are provided in preschools for children's full development and academic learning, as well as for preschoolers' readiness for school.

Keywords: early childhood; outdoor play; play yard; preschool; school readiness; PLS-SEM



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1. Introduction

Research evidence shows that a child's brain and nervous system grow and develop at the fastest rate from conception to the age of five [1]. In addition, a healthy diet is essential for children's growth and development, particularly their cognitive abilities, during the preschool years [2]. In other words, early childhood education during these formative years is crucial to their future success because early brain development influences the ability and performance of a child in school and life [3].

According to [4], preschool is strongly recommended as preparation for children before they begin their formal education in school. This is because preschool environments help to develop children with a solid foundation in both social and intellectual skills. Ref. [5] claimed that children who attended preschools performed better on arithmetic and literacy examinations, compared to children who stayed at home and were taken care of by their parents or relatives. Therefore, even though preschool education in Malaysia is not a compulsory education program, preschool enrolment among preschool students has increased from 67% in 2005 to 84.2% in 2014 [6].

Malaysian public early childhood education is overseen by four different government agencies, including: the *Jabatan Perpaduan Negara* (or National Unity Department), which falls under the responsibilities of the Department of National Unity and Integration; *Jabatan Kemajuan Masyarakat* or the Community Development Department (KEMAS) under the Ministry of Rural and Regional Development; followed by the Ministry of Education (MOE); and lastly, the State Islamic Religion Department [7]. MOE established a preschool as a trial project in 1992 as an annex to an existing primary school, known as *prasekolah* [8].

In order to standardize and improve the quality of all public and private preschools, MOE formulated the Standard National Preschool Curriculum (SNPC) in 2010 [9]. SNPC is a guideline for the Early Childhood and Care Education (ECCE) program to increase children's academic achievement and school readiness by achieving six strands of learning including: humanities, spirituality, attitudes and values, personal competencies, communication, science and technology, and physical development and aesthetics [10]. To achieve these six learning strands, learning through play has become one of the most appropriate teaching methods emphasized by MOE, and all Malaysian preschools must incorporate it into their teaching program [11].

In fact, play is the key to learning for children, and [12] asserted that children usually behave more maturely and above their age while playing. Ref. [13] further claimed that play can proceed in many forms, and provide opportunities to children to gain health and physical development, cognitive development, social and emotional development, and academic learning. It has been proven by researchers and educators all over the world that play can improve abilities for learning and can develop important skills, such as inquiry, expressiveness, experimentation, and cooperation between children [14].

In the traditional education system, the term 'play' is often portrayed in a negative light, as a meaningless activity for learning. However, experts in the field of children's development proved that 'play' is the key component in a child's brain development [15]. Ref. [16] argued that play is both a need and a right for children. Play is more than just fun, excitement, and motivation. Play builds the foundation of literacy; children learn and practice new sounds and speak out the new vocabulary on their own or with friends through play [17].

Therefore, it is undeniable that learning through play is one of the best ways to conduct early childhood education for young children to acquire knowledge and abilities [18]. A good infrastructure delivered higher chances to improve children's sense of competence by giving children optimum security and comfort [19]. However, it was found that the Malaysian education system prioritized indoor learning rather than outdoor learning, which resulted in children having limited chances to play in an outdoor environment [20,21]. Ref. [19] also mentioned that the majority of preschool operators in Malaysia often underestimate the importance of outdoor space to young children. As a result, Malaysian educators tend to be relatively ineffective in improving the performance and the quality of children's learning without suitable physical environments to integrate play. In fact, learning through play not only improves children's performance but also boosts teachers' motivation. Through play-based learning, educators have greater opportunity to gain a better understanding of each child's strengths, knowledge, skills, and needs, through observing children playing [22].

In addition, during the planning and design stage of preschools, it was found that the practitioners often used the outdoor environment inappropriately. The majority of the practitioners would deliberately expand the interior space of the preschool in order to maximize their profits by enrolling more students [23]. Moreover, the limited outdoor environment setting in preschools makes it difficult for MOE to enforce a policy that all preschools should conduct classes by learning through play method [24]. Under these circumstances, the quality, and the facilities of outdoor spaces of preschools can only be improved when the preschool operators have sufficient awareness and understanding of the interaction between children and the outdoor environment [25].

In summary, a well-designed outdoor learning environment is important to enhance children's academic performance as well as their social behavior. Children are more likely to have positive outcomes if they have an early positive childhood experience with an excellent environment [15,26]. The objectives of this study are, therefore: (a) to identify the benefits of having outdoor play yards in preschools for early childhood learning; (b) to assess the quality of outdoor play yards in preschools in the Klang Valley, Malaysia; and (c) to explore the causal effects of outdoor play on school readiness of preschoolers.

2. Literature Review

Launched as a national transformation program, the Malaysia Education Blueprint 2013–2025 (MEB 2013–2025) aims to constantly enhance quality, equity, and access in Malaysian education. Preschool education should be freely accessible, hence one of the strategic goals listed in MEB 2013–2025 is to increase the quantity and diversity of preschools while also raising the standard of early childhood education services offered across the entire nation. A child's psychological and intellectual development is greatly influenced by the Early Childhood Education (ECE) program [10], and research has shown a link between high-quality preschool education and improved employment outcomes later in life, in addition to promoting social and emotional well-being, reducing the risk of school dropout, and even promoting higher learning [27].

In order to fulfill the need for childcare, the Malaysian ECCE program was officially implemented under the Fourth Malaysia Plan (1981–1985). However, without pre-established criteria and procedures for administering childcare centers, childcare services in Malaysia were insufficient to meet rising demand and numerous complaints regarding the standards and quality of childcare services were received [3].

In the Fifth Malaysia Plan (1986–1990), the Malaysia government realized preschool education would benefit children in terms of building mental aptitude and fostering interaction among themselves. Therefore, a preschool curriculum guideline was created to formalize preschool under the Education Act and MOE was in charge of implementing such curriculum guidelines and registration of preschool centers. A pilot project known as *Prasekolah* was established by MOE in January 1992 for children aged between 5 and 6 years old to participate before entering primary school [28].

Under the Seventh Malaysia Plan (1996–2000), the Malaysia government continued to raise the preschool enrolment rate. Physical facilities for preschool instruction were expanded under this plan, and the government officially institutionalized preschool education under the Education Act of 1996. Parents were educated on the values of preschool education during the awareness campaigns. The private sectors, including non-governmental organizations, were encouraged to establish more preschools, especially in rural areas [3].

The ECCE programs in Malaysia were divided into two institutions because of the steady rise in the number of children enrolled in preschools: a children center (TASKA) for children aged 0 to 4 years, and a preschool (TADIK or TABIKA) for children aged 4 to 6 years. PERTAMA Nation Curriculum and SNPC, respectively, were introduced to both types of ECCE institutions in order to standardize facilities, curricula, and educator training [29]. Both ECCE curricula were implemented in order to give children the chance to fully develop in all areas—physical, emotional, social, intellectual, and spiritual, while using a play-based learning strategy in a setting that is suitable and safe [10].

2.1. Learning through Play (LTP)

Play itself creates unaccountable learning opportunities for children across a variety of domains, such as self-regulation, cognitive, socio-emotional, and physical domains, as well as their overall well-being [30]. According to [16], children can play anywhere and almost everywhere, and it was found that this could help children to learn faster. Therefore, play has been acknowledged as a powerful learning medium, particularly in the context of early childhood education over the course of several decades [31,32].

The ECCE curriculums were formulated by the MOE to support children's learning and development in a pleasant, safe, and joyful learning environment through flexible teaching and an integrating approach [33]. There are two categories of play in the LTP approach, such as unstructured play, and structured play. According to [34], it is called unstructured play when children develop and explore in free and voluntary play without any control by adults. On the other hand, structured play is typically directed and led by adults, where children are assigned to certain tasks and gain certain achievements, such as puzzle games [35]. Regardless of either category, teachers shall always act as an important role in observing and identifying the strengths, weaknesses, and needs of each student through play. Teachers

are only able to take appropriate steps in providing or improving the learning environment and teaching method to boost children's outcomes.

2.2. Play Yards and Outdoor Play to Children

A play yard is an area or space to allow children to experience physical activities in the outdoor environment. Other than having fun, it was found that playing in outdoor spaces could provide a greater impact on children's overall development as compared to the indoor environment [36]. Ref. [37] acknowledged the value of physical space in the early learning environment as well as the crucial role that children's physical environments play in determining their overall development. The bulk of a child's day is spent in preschool, and research has shown that this setting has a considerable impact on children's readiness for school in addition to having the greatest influence on a child's overall growth [38].

Ref. [39] defined an outdoor space as an open and continuously changing environment, in which it is possible for children to experience freedom, gross and noisy movements, as well as interaction with the elements of nature. It is undeniable that indoor play environments could also provide a high level of cognitive play, which comprises of interesting tasks and independent activities, and are frequently more emphasized than outside play environments. However, [40] firmly reiterated that outdoor play encourages children to play through touching, seeing, and feeling nature which helps to enhance physical motor development as well as healthy behavior in children. These physical activities gave a significant contribution to their overall development in terms of cognitive, motor, social and emotional. Ref. [41] also claimed that physical environments influenced children's overall developmental competence and as a result, directly reflected on their school readiness before entering primary school.

2.3. Benefits of Outdoor Play Yards in Preschools for Early Childhood Learning

Research evidence shows that a well-designed outdoor physical learning environment can exponentially increase physical and mental health, cognitive abilities, social skills, emotional well-being, and academic learning, as well as school readiness [42]. Children can learn about the world and about themselves at the same time by being allowed to play in an outdoor setting [20]. These good early-life developments will lay a strong basis for children's preparation for school, improved future academic achievement, and success in adulthood.

2.3.1. Health and Physical Development

Outdoor playgrounds provide more opportunities for children to engage in physical activity than the indoor play environment, which is great for their health and well-being and connection to nature [43]. Other than just having fun, children are able to carry out expansive movements such as running, jumping, climbing, and chasing. These physical activities help to build fitness, stamina, bone density, and agility in children [44]. The absence of activities has serious effects on children's health and could be the cause of the growing pediatric obesity epidemic [45]. A plethora of evidence claimed that some illnesses, such as heart disease, diabetes, and obesity, could be prevented by regular physical exercise through play from an early age. Outdoor play has a direct and strong impact on a child's weight, physical strength, and ability to recover from illness [46]. According to [41], children who were lack of school readiness were more likely to have health and physical issues as they were less likely to involve themselves in physical activities during the preschool period. In contrast, children who spent more active time outdoors throughout their early years are more likely to continue exercising regularly as they grow older [47]. When children play outside, they will be healthier and less likely to develop sick building syndrome, which is a condition caused by a lack of access to natural light and fresh air in interior environments [48].

Childhood obesity and being overweight has been an issue in Malaysia for a long time, there is thus a need for children to be more physically active in outdoor spaces and

facilities from an early age. Ref. [49] recommended daily playtime of 60 min for children to allow them to run and play around to sweat off the pent-up energy in their bodies. Playing outside indirectly will help to combat the rising problem of childhood obesity and obesity in our society. In addition, exposure to sunlight, natural elements, and open air is beneficial to children when playing outdoors. Children should have 400 to 600 IU of Vitamin D every day in order to develop stronger bones and a better immune system [50]. Besides, staying in an outdoor space is also beneficial to children's eye health, which helps to prevent short-sightedness in children [44].

2.3.2. Cognitive Development

Allowing children to spend more time outside and exposure to outdoor spaces helps their cognitive skills and school readiness. The outdoor environment can help foster cooperative, imaginative play, and brain development for children [51]. This is because curiosity and imaginative association are often piqued in their minds when they are playing with their peers or even alone [52]. During playtime, children will be discovering their surroundings, creating new games, enjoying sensations of independence, solving issues, and putting their ideas and answers into action [53]. Consequently, children's skills and abilities, such as organizational abilities, critical thinking, decision-making, and problem-solving, can be cultivated and strengthened through games [54].

In addition, outdoor activities allow children to explore, discover, and make sense of the natural environment with less control from parents and teachers. Children are thus able to experience rich multi-sensory experiences while playing in outdoor activities, developing a high level of awareness and interest in their surroundings. Learning about nature can help children become more conscious of the natural world around them [53]. According to [55], besides the development of their cognitive skills, children's constant exposure to the natural world also fosters a sense of love and empathy for the environment.

2.3.3. Social and Emotional Development

Compared to staying in an indoor space, children are more likely to be more socially active in an outdoor environment [50]. Outdoor play tends to require more imagination and teamwork between peers, which makes children more willing to try new activities, make new friends, make conversation with others, and build their self-esteem [20]. Of course, it does not mean that conflicts will not be raised. However, children who went to preschool and have greater school readiness are more likely to get along with their classmates than those who did not spend time outside. They have a relatively better ability and higher willingness to communicate with their peers [56]. Moreover, playing outdoors provides children with a remarkable opportunity for emotional development. Outdoor spaces and activities allow children to move freely, make noise, enjoy, and let off steam [44]. It is an added benefit for children to explore the world, and also explore themselves at the same time, when playing outdoors [57]. Outdoor play enables children to escape from stress, makes them less likely to feel overwhelmed, and reduces the level of anxiety [39]. When compared to children who went to preschool, children who were left at home or cared for by their relatives had higher rates of internalization difficulties, such as depression, weaker social skills, and poorer adaptive functioning [58]. Conversely, children who went to preschool and often play in outdoor spaces are more self-aware, as well as being better in expressing themselves, and are more mindful of others' feelings [50]. Children who play outside are less likely to bully other children, according to studies [49]. Additionally, research has shown that children are more open and willing to discuss their feelings with their parents, caregivers, and teachers, in outdoor spaces, as opposed to indoor spaces [46].

2.3.4. Academic Learning

According to [18], children learn best in early childhood via play-based learning and hands-on exploration. The outdoor environment allows children to make sense of new things and concepts based on real-life experiences by seeing and touching. Research evidence

has proven that children learn faster when they could experience it physically [59]. This could make learning new things more intriguing and exciting for them. Ref. [26] claimed that interacting with nature in a learning environment enhances and improves language proficiency, academic performance, scores, learning chances, and educational outcomes. Furthermore, one method of introducing kids to nature is through teaching them about it. This allows for the transmission of a deeper understanding of plants, animals, and other significant subjects than is achievable by rote memorization and textbook study [60].

2.4. School Readiness

According to [61], school readiness is a complex, multifaceted and systemic combination of early childhood education experiences. It can be described as a reflection of children's behavior, competencies, and achievements in preschool years [62]; children's abilities to play their role as a student, and be accustomed to the primary school setting and future studies [63]; and children's capabilities for handling all demands at school in which children are able to explore and ask questions comfortably, listen to teachers and pay attention during classes, play with classmates, and obey the rules at school [64]. Ref. [65] mentioned that children who are not yet ready for school may find it challenging to follow instructions and any activities in the classroom. Therefore, school readiness has been a critical requirement for assisting children in adapting to whatever challenges they may have at school, which will contribute greatly to children's future success [66]. According to a study by [67], academic competence, an important thinking skill, socio-emotional maturity, physical ability and motor development, self-discipline, and communication competence, are the six primary factors that determine a child's preparation for school.

Early academic skill is strongly linked to a child's school readiness. Studies have shown that children who entered primary school with early academic skills and experienced play-based learning have a higher ability to recognize letters and numbers, read, write, and spell words. Likewise, they are relatively more attentive in class and therefore they will be more able to take benefit from classroom learning opportunities because they are able to comprehend the reading and mathematics skills taught in primary school easily [68]. For these reasons, an early education program and the design quality of the preschool physical environment are both important contributors in providing positive support and enhancing children's academic skills, while at the same time strengthening children's school readiness.

2.5. Quality of Outdoor Play Yards in Preschools

Ref. [19] asserted that well-designed play spaces could contribute to a better brain structure and build a solid foundation for lifelong success in children. However, one of the biggest concerns is setting rules to mandate all preschools to have quality outdoor play yards as compulsory. Firstly, it is undeniable that educators and parents often overlook and undervalue the importance of the physical environment in children's overall development [48]. Besides, [23] also claimed that some preschool operators may reduce the area of outdoor play space to increase profits by enrolling more students or did not carry out maintenance regularly of the play facilities in order to reduce expenses. In addition, it is also found that many outdoor play spaces in preschools are inappropriately utilized, and even some preschools do not have an outdoor playground for children due to limited outdoor space. All of these reasons illustrated that the majority of the preschool operators lack awareness and understanding of the basic guidelines for setting up outdoor play yards in preschool.

2.5.1. Basic Guidelines for the Establishment of Preschool Outdoor Play Yard

During the Cabinet Meeting and the 71st National Council for Local Government in 2017, a set of basic guidelines were adopted and agreed upon by to replace the Guidelines for the Establishment of TADIK and TASKA, issued in 2012. The purpose of these guidelines [69], known as PLANMalaysia, is to standardize the built and physical environment of preschools, as well as to facilitate the assessment of preschools by the local authorities.

Preschools are required to adhere to these guidelines in terms of the overall layout, building design, basic utilities and amenities, and licensing registration and application. Briefly, some of the basic requirements for preschool play environments are outlined below, namely:

- (a) Appropriate environment: the layout, arrangement and design of preschool shall prioritize the comfort of children; and children should be able to play, learn, and move about freely in the preschool's environment.
- (b) Minimum floor area requirements: the internal floor area shall be a minimum of 15 square feet (1.4 m²) per child excluding the kitchen, toilet, staff room, storeroom and corridor.
- (c) Universal design (UD): the preschool environment must be planned following the requirements in UD; and there must be a play area in the building or any open area in the building and the space should have sufficient direct sunlight.

2.5.2. Instrument to Measure Quality Outdoor Play Yards

Preschools must have top-notch outdoor play areas if they want to give children a top-notch playing experience. As a result, it is crucial to have methods for evaluating outdoor play yards. Numerous worldwide assessment approaches are currently available to assess the caliber of outdoor play yards. Some commonly used assessment tools include: the Preschool Outdoor Environment Measurement Scale (POEMS); Infant/Toddler Environment Rating Scale (ITERS); Children's Physical Environments Rating Scale, Fifth Edition (CPERS5); Early Childhood Environment Rating Scale, Revised (ECERS-R); and Early Childhood Environment Rating Scale, Third Edition (ECERS3). Ref. [70] claimed that CPERS5 was the most objectively valid and scientifically credible assessment instrument for assessing the overall quality of outdoor play areas in pre-school facilities. In comparison to other assessment instruments, the CPERS is the only one that allows for the evaluation of the preschool built-environment in terms of its ability to promote and enhance children's cognitive development [71]. The CPERS5 is a better assessment instrument than the ECERS-R and POEMS for gauging the calibre of preschool outdoor play areas because the scale items are more accurate and stable.

The Children's Physical Environment Rating Scale (CPERS), according to [71], was created through an eight-year study carried out in Australia, New Zealand, and the United States. The CPERS was created to offer a tool for evaluating the physical environment of childcare, preschool, kindergarten, and other early childhood education facilities to early childhood educators, architects, landscape architects, and other designers, as well as legislators and regulators. The theory supporting the scale is an interactional-constructivist or ecological theory of child development and the environment, which is based on Piaget [72]. A well-designed physical environment is essential to children's growth, as shown by researchers like [73–75], who backed this view. Children need a highly resourced environment [71] if they are to be able to explore, discover, and learn, according to study.

The four sections of the CPERS are designated as Parts A, B, C, and D, respectively. Part A (Planning) is concerned with the overall planning of the building; Part B (Building as a Whole) evaluates the building's overall quality; Part C (Indoor Activity Spaces) is concerned with indoor activity areas; and Part D (Outdoor Spaces) is concerned with the outdoor activity spaces surrounding the buildings and the surrounding conditions. The CPERS contains 124 items that are grouped into 14 subscales. The quality of outdoor play spaces in preschools is evaluated using the Children's Physical Environment Rating Scale subscales 12 (Play Yards: functional needs) and 13 (Play Yards: developmental needs) (CPERS5).

3. Methodology

3.1. Research Design

By extending the conceptual model presented by [76], this study used partial least squares structural equation modelling (PLS-SEM) as the multivariate analytic approach. Hence, survey questionnaire is suitable for data collection as long as the measurement scales are equidistant. Ref. [76] found that there are significant positive relationships among

the six constructs in their conceptual model. A new construct, namely school readiness was added to investigate the causal effects of outdoor play on school readiness of preschoolers using SmartPLS 4 [77]. The conceptual model for this study consists of seven constructs, as shown in Figure 1.

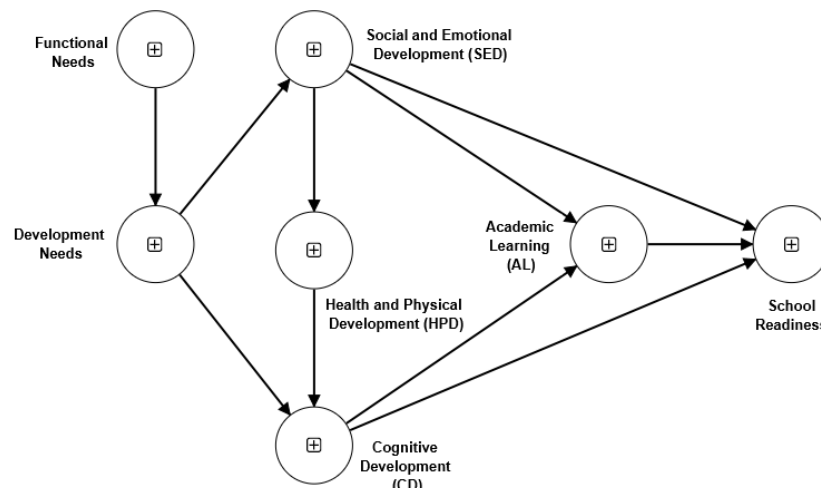


Figure 1. Conceptual model for the effects of outdoor play on school readiness.

3.2. Sampling

The respondents for this study comprised of preschool operators from the Klang Valley, Malaysia. The Klang Valley is an urban area with an estimated population of 8.42 million in 2022 [78]. A total of 402 preschools and kindergartens registered in [79] from Kuala Lumpur and Selangor with emails and mobile telephone numbers were selected for this study. From this list, 199 sets and 203 sets of survey questionnaires in Google Forms were respectively distributed through emails and WhatsApp messenger to the preschool operators in Kuala Lumpur and Selangor from June 2022 to August 2022.

The Tunku Abdul Rahman University of Management and Technology's Research Ethics Committee (TAR UC/EC/2022/03-7) granted ethics approval for this work.

3.3. Research Instrument

The questionnaire is organized into three main sections with closed-ended questions, as indicated below.

3.3.1. Demographic Information

This part is intended to gather background data about respondents, such as gender, age range, ethnicity, and the overall number of years that pre-schools have been in operation. For research reasons and to guarantee the data is gathered from trustworthy experienced professionals, additional information is required, such as the educational backgrounds of preschool operators, the locations of preschools, and the number of preschools operated by the respondents.

3.3.2. Benefits of Having Outdoor Play Yards in Preschools

There are three parts to this section. The first section focuses on the importance and implementation of outdoor play for kids, the second section discusses the significance and implementation of outdoor play areas and yards, and the third section discusses the significance of outdoor play for children as measured by four constructs: health and physical development, cognitive development, social and emotional development, and academic learning. Seven indicators for measuring health and physical development, seven indicators for measuring cognitive development, 10 indices for measuring social and emotional development, and six indicators for measuring academic learning, were found in the literature study. In part three, the respondents were initially instructed to use a

checklist to rate the four constructs. Then, based on their ideas and experiences, they were asked to rate the significance of outdoor play for each of these characteristics on a 5-point Likert scale, with 1 denoting “strongly disagree”, 2 “disagree”, 3 “neutral”, 4 “agree”, and 5 denoting “strongly agree”. One questionnaire item utilizing the same 5-point Likert scale measures students’ readiness for school.

3.3.3. Quality of Outdoor Play Yards in Preschools

This section comprises 14 questions adapted from CPERS5 to assess the quality of preschool outdoor play yards. The foundation of this section is provided by the six questions in CPERS5 subscale 12 and the eight questions in CPERS5 subscale 13, named Play Yards: functional needs, and Play Yards: developmental needs, respectively. On a 5-point scale, respondents were asked to rate the quality of their preschools’ outdoor play yards, with 0 representing “not met”, 1 representing “slightly met”, 2 representing “moderately met”, 3 representing “met”, and 4 representing “totally met”. Respondents who work in preschools that do not have outside play yards are not required to answer this question.

4. Results

4.1. Descriptive Analysis

The SPSS software was used to analyze the data obtained for descriptive statistics. Altogether eighty-four (84) questionnaires were received from the respondents; excluding four (4) questionnaires with missing data that were not considered for data analysis. Twelve of the respondents mentioned they do not have outdoor play yards in their preschools. The response rates for this questionnaire survey are shown in Table 1.

Table 1. Response rate of questionnaire survey through Google Forms.

Area/Location	Questionnaires Distributed	Questionnaires Received	Response Rate (%)	Average Response Rate (%)
Kuala Lumpur	199	41	20.6	20.9
Selangor	203	43	21.2	

Table 2 shows the demographics of the respondents who ran preschools in Kuala Lumpur and Selangor and took part in the survey. Out of the 84 questionnaires received, 74 are female and only 10 are male. Of the 84 responders, 79 (94.0%) are over the age of 30, while only five are between the ages of 21 and 30. In terms of ethnicity, 71 are Chinese, seven are Indians, and six are Malay. Seventy nine (79) preschools have been in operation for more than six years overall, according to statistics. The answer from 45 people who were asked how many preschools they owned was two or more. Eighty (80) of the respondents had a bachelor’s degree or higher because all preschool operators in Malaysia are required to have preschool education credentials recognized by the Malaysian MOE in order to start up and operate a preschool. Every preschool instructor must have a minimum diploma qualification, according to MEB 2013-2025 [10].

4.2. The Importance of Outdoor Play Yards and Playgrounds

The findings regarding the value and use of outdoor play and outdoor play yards in children’s learning and development are summarized in Table 3. Children’s growth depends on outside play, and a suitable outdoor play area is necessary to encourage outdoor play, according to all 84 respondents who completed and returned the Google Forms questionnaires, even though 12 (14.3%) indicated they do not own outdoor play yards and thus do not implement outdoor play in their preschools. All the 84 respondents indicated outdoor play is important to children’s development in terms of health and physical development, cognitive development, social and emotion development, and academic learning.

Table 2. Demographic information of respondents ($n = 84$).

Variable	Response Category	Frequency	Percentage (%)	Total Percentage (%)
Gender	Male	10	11.9	100
	Female	74	88.1	
Age Group	21–30	5	6.0	100
	31–40	23	27.4	
	42–50	36	42.9	
	51–60	20	23.8	
	61 and above	0	0.0	
Ethnic Group	Chinese	71	84.5	100
	Indian	7	8.3	
	Malay	6	7.1	
	Others (Please Specify)	0	0.0	
Educational Level	SPM	0	0.0	100
	Diploma	4	4.8	
	Bachelor Degree	57	67.9	
	Master Degree	18	21.4	
	PhD	5	6.0	
	Others (Please Specify)	0	0.0	
Experience in Operating Preschool	5 years or less	5	6.0	100
	6–10 years	11	13.1	
	11–15 years	32	38.1	
	16–20 years	28	33.3	
	21 years and above	8	9.5	
Number of Preschools Operated	1	39	46.4	100
	2	36	42.9	
	3	6	7.1	
	4 and above	3	3.6	

Table 3. Outdoor play and outdoor play yards in preschool ($n = 84$).

Statement		Response Category	Frequency	Percentage (%)
Is outdoor play important to children’s development?		Yes	84	85.7
		No	0	14.3
Does your preschool implement outdoor play for children’s learning?		Yes	72	100.0
		No	12	14.3
Is a well-designed outdoor play space essential to support outdoor play experience?		Yes	84	100.0
		No	0	0.0
Does your preschool own an outdoor play yard for children’s learning?		Yes	72	85.7
		No	12	14.3
Is outdoor play important to children in terms of the development listed?	Health and Physical Development	Yes	84	100.0
	Cognitive Development	Yes	84	100.0
	Social and Emotion Development	Yes	84	100.0
	Academic Learning	Yes	84	100.0

The raw data from respondents without outdoor play yards were excluded from analysis. The indicators in Table 4 operationalize the four components evaluating the importance of outdoor play to early childhood development and learning. With an overall mean score of 4.485, social and emotional development was determined to be the most important of the four aspects. Cognitive development came in second with an overall mean score of 4.49, while health and physical development came in third with an overall mean score of 4.46. With an overall mean score of 4.42, academic learning is considered as the least significant of the four constructs. In Table 4, the indicators for these four constructs have skewness values ranging from -1.494 to 0.345 , and kurtosis values ranging from -1.935 to 1.338 , showing

that these indicators do not depart from the normality requirements according to Brown (cited in [80]).

Table 4. Importance of outdoor play to children ($n = 72$).

Construct	Indicator		Mean	Standard Deviation	Skewness	Kurtosis	Overall Mean
	Description	Symbol					
Health and Physical Development	Children are more likely to be active	HPDQ4	4.67	0.475	−0.722	−1.521	4.460
	Prevent illnesses such as diabetes and obesity	HPDQ5	4.33	0.605	−0.305	−0.617	
	Reduce obesity and overweigh among children	HPDQ6	4.28	0.633	−0.300	−0.626	
	Gain better ability to recover from illnesses	HPDQ7	4.19	0.685	−0.268	−0.831	
	Good for physical growth	HPDQ8	4.60	0.548	−0.927	−0.176	
	More likely to continue exercise as they grow up	HPDQ9	4.57	0.601	−1.075	0.184	
	More opportunities to access to natural light and fresh air	HPDQ10	4.58	0.550	−0.862	−0.305	
Cognitive Development	Foster cooperation	CDQ11	4.46	0.580	−0.502	−0.674	4.490
	Develop imagination	CDQ12	4.42	0.496	0.345	−1.935	
	Enhance brain development and memory	CDQ13	4.60	0.573	−1.087	0.231	
	Have a chance to interact with nature	CDQ14	4.53	0.556	−0.618	−0.690	
	Cultivate skills and abilities such as organizational abilities, critical thinking, decision making, and problem solving	CDQ15	4.38	0.659	−0.583	−0.633	
	Children are able to experience rich multi-sensory experiences such as sense of sights, sounds, smells, and touch	CDQ16	4.51	0.531	−0.348	−1.260	
	Make children become more conscious of the natural world around them	CDQ17	4.53	0.581	−0.776	−0.361	
Social and Emotional Development	Likely to be more socially active	SEDQ18	4.57	0.526	−0.584	−1.019	4.485
	More willing to try new activities	SEDQ19	4.43	0.552	−0.234	−0.969	
	Easy to make new friends	SEDQ20	4.51	0.556	−0.560	−0.758	
	Better ability and higher willingness to communicate with others	SEDQ21	4.56	0.603	−1.014	0.058	
	Strengthen children's self-esteem	SEDQ22	4.36	0.635	−0.0475	−0.630	
	Have opportunity to explore the world and also explore themselves	SEDQ23	4.43	0.526	−0.013	−1.352	
	Enable children to escape from stress, makes them less likely to feel overwhelmed, and reduces their level of anxiety	SEDQ24	4.50	0.531	−0.291	−1.296	
	Children are more self-conscious and better at expressing themselves	SEDQ25	4.49	0.581	−0.609	−0.578	
	More mindful of others' feelings	SEDQ26	4.43	0.646	−0.700	−0.494	
Academic Learning	Children are happier	SEDQ27	4.57	0.526	−1.306	0.580	4.420
	Children are more able to make sense of new things and concepts based on real-life experiences by seeing and touching	AL28	4.50	0.531	−0.291	−1.296	
	Learning become more meaningful and enjoyable	AL29	4.44	0.554	−0.286	−0.956	
	Children can be fast learners in class	AL30	4.49	0.671	−0.954	−0.234	
	Boosting and improving language level, learning opportunities, and educational performance	AL31	4.44	0.554	−0.286	−0.956	
	Impart a more in-depth understanding of plants, animals, and nature	AL32	4.33	0.872	−1.369	1.338	
	Have a higher ability to recognize letters and numbers, read, write, and spell words	AL33	4.32	0.709	−0.550	−0.840	
School Readiness	Increase children's school readiness	School Readiness	4.74	0.475	−1.494	1.204	4.740

Table 5 displays the findings based on responses from 72 preschools that have implemented outdoor play yards. Based on replies from 72 preschool operators in Kuala Lumpur and Selangor, their preschools' outdoor play yards met the quality requirements outlined in CPERS5, with overall mean ratings of 2.463 for functional needs and 2.633 for development needs, respectively. In Table 5, the indicators have skewness values ranging from −0.755 to 0.583, and kurtosis values ranging from −1.249 to 0.877, showing that the indicators for

functional and development needs also do not depart from the normality requirements according to Brown (cited in [80]).

Table 5. Functional and development needs of play yards ($n = 72$).

Construct	Indicator		Mean	Standard Deviation	Skewness	Kurtosis	Overall Mean
	Description	Symbol					
Functional Needs	The play yards have both sunny and shady areas	FNQ1	3.18	0.828	−0.658	−0.389	2.463
	The play yards allow mobility for children using wheelchairs or crutches (e.g., wide, and hard paths, smooth ground surfaces, gentle slopes, and ramps, etc.)	FNQ2	1.90	1.128	−0.107	−1.107	
	Some of the play yard is open and largely flat	FNQ3	3.01	0.847	−0.170	−1.249	
	There is a large accessible storage room for outdoor play equipment	FNQ4	1.65	1.247	0.291	−0.946	
	There is a large accessible storage room for outdoor play equipment	FNQ5	2.26	1.343	−0.321	−1.076	
	There are roofed outdoor areas that protect children's activities in most local weather conditions (e.g., snow, heat, rain, etc.)	FNQ6	2.78	0.923	−0.755	0.877	
Development Needs	The play yard(s) provides enough diversity, such as a variety of surfaces for different types of play, to be interesting for children (e.g., grass, hard surfaces, sand, etc.)	DNQ7	2.92	0.975	−0.392	−0.947	2.633
	The play yards have both large and small areas for children to play	DNQ8	3.08	0.727	−0.355	−0.298	
	The play yards have space for social and fantasy play (e.g., quiet areas away from physical play, cubby house, outdoor playhouse, storage for dress-up props, etc.)	DNQ9	2.81	0.973	−0.255	−0.980	
	Some of the play yards are smaller and have a friendly feeling (e.g., intimate character, natural elements, etc.)	DNQ10	2.68	0.901	−0.384	0.034	
	Some of the play yards contain contours that are safe yet challenging enough for children to play on	DNQ11	2.93	0.893	−0.593	0.317	
	Secret or retreat places exist for a child to take time to be alone yet within sight of adults	DNQ12	2.29	1.041	−0.155	−0.499	
	There is a garden that children help to maintain	DNQ13	2.82	1.025	−0.512	−0.486	
	There is an identifiable area for outdoor water play (e.g., outdoor water table, tap, sprinklers, natural ponds, etc.)	DNQ14	1.53	1.186	0.583	−0.458	

4.3. Structural Equation Modelling

PLS-SEM, or partial least squares structural equation modelling, was used as the multivariate analysis method to explore the causal effects of outdoor play on school readiness of preschoolers using the SmartPLS 4 software [77], which was recently released in August 2022. The 2-step procedure recommended by [81] was adopted for assessments of measurement models and structural model.

4.3.1. Conceptual Model

The conceptual model has seven constructs, as illustrated in Figure 1. The developmental needs of an outdoor play yard are viewed as an endogenous latent construct to functional needs with eight indicators, whereas the functional needs of an outdoor play yard are thought of as an exogenous latent construct with six indications (please refer to Table 5 for the indicators and symbols used). Social and emotional development (10 indicators) and cognitive development (seven indicators) are both endogenous latent constructs to development needs, with health and physical development (seven indicators) acting as an endogenous construct between these two constructs. Academic learning is an endogenous latent construct to the social and emotional development construct and the cognitive development construct, having six indicators. Finally, school readiness is envisioned as a dormant endogenous construct with a single indicator (please refer to Table 4 for the indicators and symbols used). Any arrows linking two constructs represent perceived causal relationship between the two constructs.

A PLS model's sample size should be bigger than either: (i) 10 times the number of formative variables used to assess a latent construct; or (ii) 10 times the number of paths

aimed at a latent construct in the structural model, according to Barclay, Higgins, and Thompson (cited in [82]). The minimum sample size in Figure 2 is 30, as all the variables are reflective and there are a maximum of three (iii) pathways that can be directed at a latent construct. This study's sample size was larger than the cutoff at 72. To evaluate the conceptual model, the partial least squares structural equation modelling (PLS-SEM) approach with 3000 iterations and bootstrapping with 5000 iterations were used.

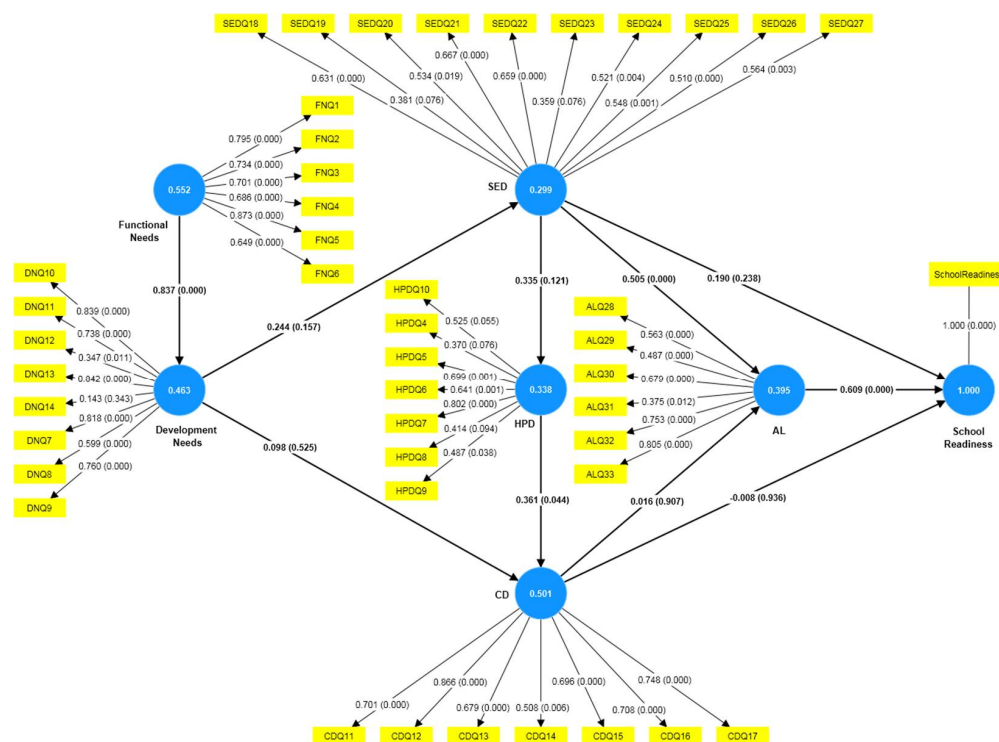


Figure 2. Conceptual model with AVE values, path coefficients, and p values ($n = 72$).

4.3.2. Evaluation of Measurement Models

The measurement models in Figure 2 were evaluated using the following criteria, and Table 6 summarizes the evaluation findings:

- Internal consistency reliability:
 - An indicator's range and meaning are similar for a construct with a high Cronbach's alpha value [83].
 - In an exploratory investigation, composite reliability (CR) values better than 0.60 are acceptable [84].
- Reliability of the indicator: loading values of 0.5 and higher are acceptable if adding up the loadings yields higher loading scores that contribute to AVE scores higher than 0.5 [85].
- Convergent validity: according to the guidelines provided by [86–88], each construct must explain at least 50% of the average variation.
- Rho_A: according to Cronbach's alpha and composite reliability, the reliability. Rho_A typically falls between the two [89].
- Discriminant validity: a construct's square root of AVE ought to be greater than the correlations between it and other constructs in the model [87]. According to [90], a value of 0.90 for HTMT.90 suggests that there is a discriminant validity issue. Each indicator should load highly on its own concept but poorly on other constructs when examining discriminant validity using cross loadings. Cross loadings under 0.1 need to be removed [91].

Table 6. Assessment results of measurement models ($n = 72$; CI = 95%).

Construct	Code	Outer Loadings (>0.50)	Outer Collinearity (For Formative Model)	Construct Reliability and Validity			
				Cronbach's Alpha	Rho_A	Composite Reliability, Rho_C (>0.50 but <0.90)	AVE (≥ 0.50)
Academic Learning	ALQ28	0.563	1.343	0.672	0.736	0.787	0.395
	ALQ29	0.487	1.323				
	ALQ30	0.679	1.397				
	ALQ31	0.375	1.221				
	ALQ32	0.753	1.626				
	ALQ33	0.805	1.498				
Cognitive Development	CDQ11	0.701	2.023	0.832	0.845	0.873	0.501
	CDQ12	0.866	2.937				
	CDQ13	0.679	1.558				
	CDQ14	0.508	1.418				
	CDQ15	0.696	1.865				
	CDQ16	0.708	1.574				
	CDQ17	0.748	1.937				
Development Needs	DNQ10	0.839	2.590	0.810	0.884	0.858	0.463
	DNQ11	0.738	1.740				
	DNQ12	0.347	1.533				
	DNQ13	0.842	2.693				
	DNQ14	0.143	1.226				
	DNQ7	0.818	2.382				
	DNQ8	0.599	1.709				
Functional Needs	DNQ9	0.760	2.244	0.835	0.849	0.880	0.552
	FNQ1	0.795	2.165				
	FNQ2	0.734	1.663				
	FNQ3	0.701	1.466				
	FNQ4	0.686	1.723				
	FNQ5	0.873	2.843				
Health and Physical Development	FNQ6	0.649	1.480	0.668	0.736	0.770	0.338
	HPDQ10	0.525	1.391				
	HPDQ4	0.370	1.156				
	HPDQ5	0.699	1.812				
	HPDQ6	0.641	1.988				
	HPDQ7	0.802	1.609				
	HPDQ8	0.414	1.391				
Social and Emotional Development	HPDQ9	0.487	1.420	0.733	0.738	0.805	0.299
	SEDQ18	0.631	1.370				
	SEDQ19	0.381	1.281				
	SEDQ20	0.534	1.577				
	SEDQ21	0.667	1.590				
	SEDQ22	0.659	1.501				
	SEDQ23	0.359	1.586				
	SEDQ24	0.521	1.356				
	SEDQ25	0.548	1.532				
School Readiness	SEDQ26	0.510	1.314				
	SEDQ27	0.564	1.692				
	School Readiness	1.000	1.000	—	—	—	—

According to the stated requirements, the measurement models were unable to achieve indicator reliability with nine indicators having outer loadings less than 0.50 or convergent

validity with AVE <0.50 for four of the constructs. The results of comparing the cross loadings between the indicators are summarized in Table 7. To further evaluate the measurement models' discriminant validity, it is necessary to remove the eight indicators (in italics) with cross loadings below 0.10 (in italics).

Table 7. Discriminant validity using cross loadings.

Indicator	AL	CD	Development Needs	Functional Needs	HPD	SED	School Readiness
ALQ28	0.563	−0.027	0.452	0.427	0.033	0.258	0.419
ALQ29	<i>0.487</i>	0.131	0.048	−0.060	−0.053	0.159	<i>0.399</i>
ALQ30	0.679	0.112	0.425	0.301	−0.117	0.275	0.453
ALQ31	<i>0.375</i>	0.136	0.209	0.070	0.226	<i>0.405</i>	0.131
ALQ32	0.753	0.059	0.429	0.337	−0.105	0.365	0.420
ALQ33	0.805	0.189	0.308	0.205	0.035	0.443	0.673
CDQ11	0.137	0.701	0.229	0.248	0.239	0.209	0.139
CDQ12	0.113	0.866	0.012	−0.052	0.307	0.273	0.055
CDQ13	0.004	0.679	0.036	−0.019	0.283	0.102	0.122
CDQ14	−0.123	0.508	−0.102	−0.077	0.226	0.086	0.001
CDQ15	0.163	0.696	−0.027	0.007	0.288	0.223	0.051
CDQ16	0.073	0.708	−0.014	−0.043	0.327	0.143	0.043
CDQ17	0.288	0.748	0.151	0.186	0.122	0.341	0.257
DNQ10	0.419	0.109	0.839	0.713	0.010	0.232	0.426
DNQ11	0.390	0.081	0.738	0.528	−0.030	0.282	0.388
DNQ12	0.042	<i>0.282</i>	<i>0.347</i>	0.193	0.047	−0.131	−0.013
DNQ13	0.380	0.140	<i>0.842</i>	<i>0.806</i>	−0.028	0.175	0.393
DNQ14	−0.034	0.113	<i>0.143</i>	<i>0.149</i>	0.131	0.073	−0.124
DNQ7	0.467	−0.071	0.818	0.690	−0.086	0.278	0.408
DNQ8	0.434	0.065	0.599	0.432	−0.064	0.256	0.310
DNQ9	0.325	−0.058	0.760	0.638	−0.072	−0.041	0.345
FNQ1	0.313	0.071	0.661	0.795	−0.125	0.111	0.374
FNQ2	0.156	0.015	0.566	0.734	0.052	0.216	0.188
FNQ3	0.274	0.050	<i>0.632</i>	<i>0.701</i>	−0.061	0.109	0.254
FNQ4	0.238	0.047	<i>0.595</i>	<i>0.686</i>	−0.030	0.128	0.319
FNQ5	0.394	0.124	0.751	0.873	−0.094	0.194	0.487
FNQ6	0.148	−0.018	0.485	0.649	0.033	0.048	0.154
HPDQ10	−0.069	0.291	−0.106	−0.059	0.525	0.008	−0.103
HPDQ4	0.065	−0.011	0.240	0.190	0.370	0.149	0.104
HPDQ5	−0.006	0.127	0.017	0.057	0.699	0.306	0.016
HPDQ6	−0.082	0.210	−0.076	0.024	0.641	0.121	−0.081
HPDQ7	0.072	0.299	0.025	−0.028	0.802	0.376	0.073
HPDQ8	−0.036	0.202	−0.130	−0.179	0.414	0.143	0.019
HPDQ9	−0.027	0.230	−0.067	−0.161	0.487	0.090	−0.009
SEDQ18	0.317	0.121	0.296	0.222	0.178	0.631	0.385
SEDQ19	0.259	0.260	0.037	−0.019	<i>0.358</i>	<i>0.381</i>	0.225
SEDQ20	0.107	0.371	−0.014	−0.099	0.315	0.534	0.147
SEDQ21	0.259	0.128	0.042	0.071	0.292	0.667	0.224
SEDQ22	0.392	0.185	0.104	0.040	0.177	0.659	0.321
SEDQ23	0.234	−0.019	0.172	0.032	−0.123	0.359	0.123
SEDQ24	0.265	0.195	0.290	0.292	0.101	0.521	0.196
SEDQ25	0.295	0.314	0.165	0.145	0.003	0.548	0.318
SEDQ26	0.354	−0.037	0.074	0.080	0.224	0.510	0.376
SEDQ27	0.150	0.134	0.123	0.150	0.198	0.564	0.211
School Readiness	0.704	0.147	0.472	0.414	0.010	0.498	1.000

Additionally, Table 8 demonstrates that the measurement models do not attain adequate discriminant validity since for any of the constructs, the square root of AVE (along the diagonal) does not exceed the correlation (off the diagonal). In addition, Table 9 shows there is problem with discriminant validity because there is an HTMT₉₀ value that is more than 0.90.

Table 8. Discriminant validity using Fornell and Larcker criterion.

Construct	AL	CD	Development Needs	Functional Needs	HPD	SED	School Readiness
AL	0.628						
CD	0.164	0.708					
Development Needs	0.504	0.082	0.680				
Functional Needs	0.354	0.072	0.837	0.743			
HPD	−0.010	0.357	−0.044	−0.060	0.581		
SED	0.510	0.292	0.244	0.184	0.335	0.547	
School Readiness	0.704	0.147	0.472	0.414	0.010	0.498	1.000

Table 9. Discriminant validity using Heterotrait-Monotrait ratio of correlation.

Construct	AL	CD	Development Needs	Functional Needs	HPD	SED	School Readiness
AL							
CD	0.306						
Development Needs	0.726	0.276					
Functional _Needs	0.509	0.201	0.954				
HPD	0.319	0.484	0.335	0.279			
SED	0.689	0.441	0.408	0.305	0.530		
School Readiness	0.794	0.148	0.510	0.438	0.119	0.526	

4.3.3. Structural Model Evaluation

The following standards were used to evaluate the structural model depicted in Figure 2:

- Standardized Root Mean Square Relative (SRMR): a value of less than 0.10 is regarded as being well-fit [92].
- Normed Fit Index (NFI): a value greater than 0.9 typically denotes a satisfactory fit [93].

Table 10 summarizes the assessment results on structural model fit, which demonstrate that the structural model does not have a satisfactory fit with SRMR = 0.118 and NFI = 0.326.

Table 10. Assessment results of structural model ($n = 72$; CI = 95%).

Item	Saturated Model				Estimated Model			
	Original Model	Sample Mean	95%	99%	Estimated Model	Sample Mean	95%	99%
SRMR (≤ 0.10)	0.118	0.094	0.108	0.116	0.131	0.101	0.116	0.124
NFI (≥ 0.90)	0.326				0.316			

4.4. Improvement of Measurement Models

In order to improve the measurement models, the following steps are taken:

- (a) To achieve discriminant validity by looking at the cross loadings, where each indicator should load high on its own construct but low on other constructs. Cross loadings of <0.1 should be deleted [91].
- (b) To achieve convergent validity with $AVE > 0.50$, relevance testing suggested by [94] through:
 - (i) deletion of indicators with outer loadings < 0.40 ;
 - (ii) retaining of indicators with outer loadings > 0.70 ;
 - (iii) analyzing the impact of indicator deletion and retention on AVE and composite reliability when the outer loading is > 0.40 but < 0.70 .
- (c) To achieve discriminant validity with HTMT₉₀ value ≤ 0.90 .
- (d) To achieve discriminant validity using Fornell and Larcker criterion, that is, a construct's square root of AVE should be greater than its correlations with other constructs in the model.

Based on the steps mentioned above, eight (8) indicators in Table 9 with cross loadings < 0.10 are removed, as well as two indicators with outer loadings < 0.40 (highlighted in yellow). Relevance testing suggested by [94] through deletion and retaining of outer loadings > 0.40 but > 0.70 produced the final conceptual model as shown in Figure 3.

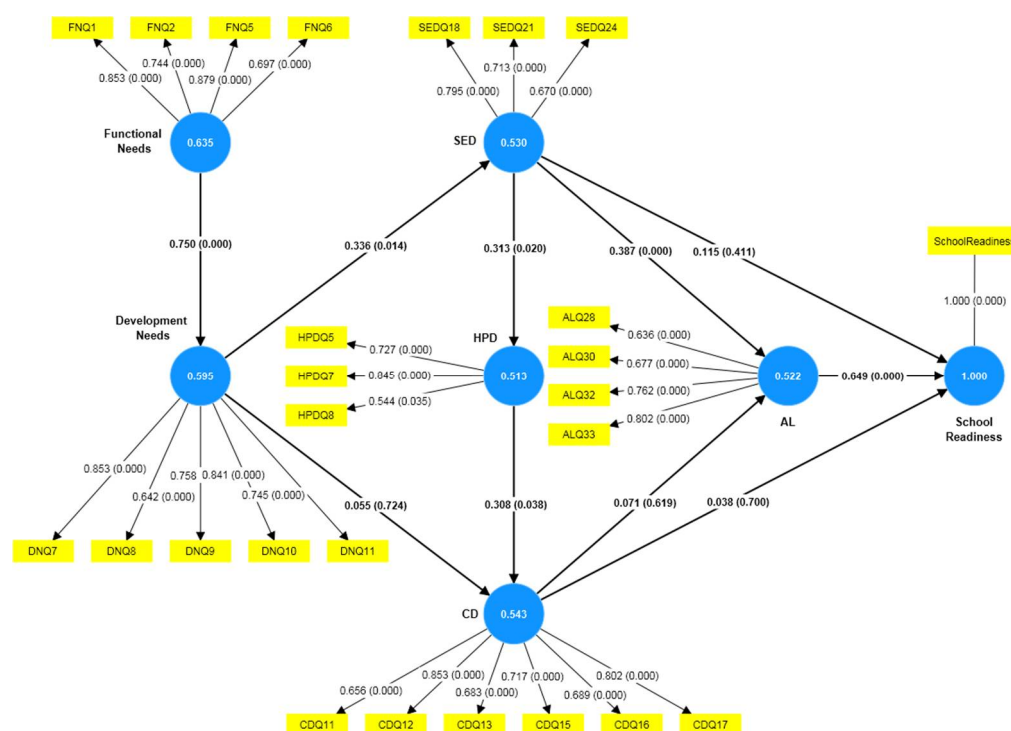


Figure 3. Final conceptual model with AVE values, path coefficients, and p values ($n = 72$).

As demonstrated in Table 11, the measurement models attain convergent validity with $AVE > 0.50$ for all seven constructs based on the criteria provided. Table 11 also summarizes the final conceptual model's coefficient of determination scores (R^2). R^2 represents the amount of variance in the endogenous construct explained by all of the exogenous constructs associated to it and is a measure of the model's prediction accuracy. According to [81], acceptable R^2 scores are 0.75, 0.50, and 0.25 for significant, moderate, and modest levels of predictive accuracy, respectively.

Table 11. Assessment of measurement models ($n = 72$; CI = 95%).

Construct	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	Average Variance Extracted	R Squared			
					Original Sample	T Statistics	p Values	Comment
Functional Needs	0.806	0.836	0.873	0.635	—	—	—	—
Development Needs	0.828	0.851	0.879	0.595	0.562	8.015	0.000	Moderate
SED	0.563	0.577	0.771	0.530	0.113	1.384	0.167	Weak
HPD	0.509	0.549	0.754	0.513	0.098	1.380	0.168	Weak
CD	0.830	0.845	0.876	0.543	0.097	1.217	0.224	Weak
AL	0.695	0.715	0.812	0.522	0.167	2.115	0.034	Weak
School Readiness	—	—	—	1.000	0.505	6.783	0.000	Moderate

The measurement models attain sufficient discriminant validity, as shown in Table 12, because the square root of AVE (along the diagonal) is greater than the correlation (off diagonal) for all constructs. In addition, Table 13 shows the measurement models have no problem too with discriminant validity because there is no HTMT₉₀ value which is more than 0.90.

Table 12. Discriminant validity using Fornell and Larcker criterion ($n = 72$; CI = 95%).

Construct	AL	CD	Development Needs	Functional Needs	HPD	SED	School Readiness
AL	0.722						
CD	0.153	0.737					
Development Needs	0.568	0.041	0.772				
Functional Needs	0.407	0.079	0.750	0.797			
HPD	−0.014	0.306	−0.047	−0.060	0.716		
SED	0.402	0.211	0.336	0.270	0.313	0.728	
School Readiness	0.701	0.161	0.489	0.401	0.058	0.384	1.000

Table 13. Discriminant validity using Heterotrait-Monotrait ratio ($n = 72$; CI = 95%).

Construct	AL	CD	Development Needs	Functional Needs	HPD	SED	School Readiness
AL							
CD	0.265						
Development Needs	0.767	0.181					
Functional Needs	0.551	0.201	0.892				
HPD	0.249	0.493	0.218	0.233			
SED	0.619	0.322	0.481	0.400	0.602		
School Readiness	0.816	0.166	0.536	0.421	0.071	0.490	

The assessment results on model fit of final structural model are summarized in Table 14, showing the SRMR has improved to 0.105 with NFI = 0.524. The goodness of fit (GoF) for the model can be determined manually using the formula $GoF = \sqrt{[(\text{mean } R^2) \times (\text{mean AVE})]}$ according to [95]. Based on the mean R^2 value of 0.257 and mean AVE value of 0.556 for the first six constructs in Table 11, the GoF for the model is found to be $\sqrt{(0.257 \times 0.556)} = 0.378$, which is larger than 0.36 for large fit [96]. It can be concluded that the GoF for the model is large for global PLS model validity.

Table 14. Assessment results of final structural model ($n = 72$; CI = 95%).

Item	Saturated Model				Estimated Model			
	Original Sample	Sample Mean	95%	99%	Original Sample	Sample Mean	95%	99%
SRMR (≤ 0.10)	0.105	0.083	0.096	0.106	0.135	0.096	0.114	0.125
NFI (≥ 0.90)	0.524				0.501			

The path coefficients and effect sizes of the final conceptual model shown in Figure 3, generated using bootstrapping function in SmartPLS 4 [77] with 5000 iterations, are presented in Table 15. According to [97], the values of 0.02, 0.15, and 0.35 represent a small, medium, and large effect, respectively.

Table 15. Path coefficients and effect sizes of final conceptual model ($n = 72$; CI = 95%).

Path	Path Coefficients					Effect Size, f^2	
	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	p Values	Value (p-Value in Bracket)	Comment
Functional Needs → Development Needs	0.750	0.756	0.047	15.995	0.000	1.285 (0.002)	Large
Development Needs → SED	0.336	0.344	0.137	2.451	0.014	0.127 (0.286)	Small
SED → HPD	0.313	0.321	0.134	2.336	0.020	0.109 (0.266)	Small
SED → AL	0.387	0.401	0.101	3.850	0.000	0.172 (0.121)	Medium
AL → School Readiness	0.649	0.651	0.082	7.880	0.000	0.708 (0.013)	Large
HPD → CD	0.308	0.334	0.149	2.077	0.038	0.105 (0.382)	Small
SED → School Readiness	0.115	0.102	0.140	0.822	0.411	0.022 (0.754)	Small
Development Needs → CD	0.055	0.055	0.156	0.353	0.724	0.003 (0.935)	Negligible
CD → AL	0.071	0.076	0.142	0.497	0.619	0.006 (0.895)	Negligible
CD → School Readiness	0.038	0.036	0.099	0.385	0.700	0.003 (0.931)	Negligible

5. Discussion

From the results presented in Table 3, all 84 respondents indicated that to support outdoor play experiences, a well-designed outdoor play space is crucial. In other words, the study subjects' preschools were run in accordance with the Malaysia Education Blueprint 2013–2015, with a focus on the Early Childhood Education [10] program, which supports young children's intellectual and psychological growth as well as their social and emotional well-being [27]. Despite the fact that 12 respondents do not have outdoor play yards in their preschools, all 84 respondents unequivocally answered that children's social and emotional development, cognitive development, physical growth, and academic learning, are all impacted by outdoor play, with overall mean values ranging from 4.490 to 4.420 when arranged in descending order, as shown in Table 4. Social and emotional development has the highest overall mean value which concurred with the result obtained by [76]. All 72 respondents who own outdoor play yards and implemented outdoor play in their preschools indicated that outdoor play does help to increase children's school readiness, with an overall mean value of 4.740.

From the results shown in Table 5, the quality of outdoor play yards for functional needs is close to moderately high, with an overall mean value of 2.463. Two indicators with mean values >3.0 which have been found to highly meet the functional needs are sunny and shady areas in the play yards, and some of the play yards are open and largely flat. These encouraging standards for play in the built environment created for young children during their preschool education show that the study subjects were aware of the fact that play accelerates learning, as stated by [31,32]. Furthermore, the study subjects completely agreed with previous studies [40,41,43] that outdoor play among young children had a significant impact on the children's general developmental competence, which reflected on school readiness prior to entering primary school.

Additionally seen in Table 5 is that two indicators with mean values <2.0 , which are below moderately met criteria, are mobility provision for children using a wheelchair or crutches, meaning the preschools do not fully meet universal design (UD) criteria; and the provision of large accessible storage rooms for outdoor play equipment. As a result, the lack of play yard space reported in the majority of preschool operators in the survey suggests that children with disabilities may be deprived of opportunity to engage in physical activity. The lack of physical activities in preschool education may have major consequences for children's health, such as the pediatric obesity pandemic and physical strength [44–46].

The quality of outdoor play yards for development needs is slightly above moderately high, with an overall mean value of 2.633. One indicator with mean value > 3.0 , which highly met the development needs, is the provision of small and large area in the play yard for children to play. There are four indicators with mean values close to 3.0, namely play yards which contain features that are both safe and challenging for children to play on, the provision of a diversity of surfaces in the play yards for different types of play, a garden in the play yard where children can help to maintain, and the provision of space in the play yard for social and fantasy play. One indicator has a mean value of 1.53, which shows that most of the play yards do not have an identifiable area for outdoor water play. However, this study supports earlier studies by [36–38] in asserting that outdoor play yards could provide outside spaces and have a greater impact on preschoolers' overall development than an indoor learning environment in terms of satisfying the developmental needs of young children.

The results summarized in Table 15 show there are six significant paths among the seven constructs, while the other four paths with $p > 0.05$ show that the relationships are not significant. The six significant paths are:

- (a) Functional needs is a significant predictor of development needs ($\beta = 0.750, p < 0.001$);
- (b) Development needs is a significant predictor of social and emotional development ($\beta = 0.336, p < 0.05$);
- (c) Social and emotional development is a significant predictor of health and physical development ($\beta = 0.313, p < 0.05$);
- (d) Academic learning is a significant predictor of social and emotional development ($\beta = 0.387, p < 0.001$);
- (e) School readiness is a significant predictor of academic learning ($\beta = 0.649, p < 0.001$);
- (f) Cognitive development is a significant predictor of health and physical development ($\beta = 0.308, p < 0.05$).

6. Conclusions

This study explored the causal effects of outdoor play on school readiness by extending the conceptual model proposed by [76]. Based on the results summarized in Table 15, the following conclusions can be made for significant positive paths:

- (a) Functional needs has significant positive relationship with development needs with $\beta = 0.750, p < 0.001$. The effect size is large with $f^2 = 1.285, p < 0.05$.
- (b) Development needs has significant positive relationship with social and emotional development, with $\beta = 0.336, p < 0.05$. The effect size is small with $f^2 = 0.127, p > 0.05$.

- (c) Social and emotional development has significant positive relationship with health and physical development with $\beta = 0.313$, $p < 0.05$. The effect size is small with $f^2 = 0.109$, $p > 0.05$.
- (d) Health and physical development have significant positive relationship with cognitive development with $\beta = 0.308$, $p < 0.05$. The effect size is small with $f^2 = 0.105$, $p > 0.05$.
- (e) Social and emotional development has significant positive relationship with academic learning with $\beta = 0.387$, $p < 0.001$. The effect size is medium with $f^2 = 0.172$, $p > 0.05$.
- (f) Academic learning has significant positive relationship with school readiness with $\beta = 0.649$, $p < 0.001$. The effect size is large with $f^2 = 0.708$, $p < 0.05$.

For the other positive but insignificant paths, the following conclusions can be made:

- (a) Development needs has positive but insignificant relationship with cognitive development with $\beta = 0.055$, $p > 0.05$. The effect size is negligible with $f^2 = 0.003$, $p > 0.05$.
- (b) Cognitive development has positive but insignificant relationship with academic learning with $\beta = 0.071$, $p > 0.05$. The effect size is negligible with $f^2 = 0.006$, $p > 0.05$.
- (c) Social and emotional development has positive but insignificant relationship with School readiness with $\beta = 0.115$, $p > 0.05$. The effect size is small with $f^2 = 0.022$, $p > 0.05$.
- (d) Cognitive development has positive but insignificant relationship with school readiness with $\beta = 0.038$, $p > 0.05$. The effect size is negligible with $f^2 = 0.003$, $p > 0.05$.

The findings from this study confirm five of the significant positive paths found by [76], with the other two paths being found to be positive but insignificant in this study. The results of this study which confirm the findings of other studies include:

- (a) The quality of outdoor play yards in terms of functional needs and development needs in this study are moderately high, i.e., 2.463 and 2.633, respectively; whereas the values are almost moderately high, i.e., 2.333 and 2.218, respectively for 62 respondents from Penang by using the same scale as found by [76]. Ref. [98] found that the design quality of preschool physical environment of 16 MOE preschools is 1.90 by using CPERS5, which is close to moderately met criterion.
- (b) Social and emotional development has been found to be the most important development with an overall mean value of 4.485; whereas social and emotional development has also been found by [76] to be the most important development with an overall mean value of 4.640.
- (c) The construct reliability and validity of functional needs and development needs are high with the values presented in Tables 6 and 11 in this study, and in Table 8 in [76]. The Cronbach's generalizability coefficient G values for functional needs and development needs reported by [37] are 0.81 and 0.94, respectively, whereas the internal consistency Cronbach's alpha are 0.53 and 0.87, respectively.

In summary, this study provides empirical proofs to substantiate the causal effects of outdoor play on school readiness of preschool children, confirming the finding by [98] who found a significant positive correlation between PPE design quality and cognitive school readiness of 336 children from 16 MOE preschools, with Pearson's R-coefficient = 0.57 and $p = 0.001$.

In view of the practical values of the findings, important stakeholders, such as preschool providers, preschool designers, and preschool educators, as well as parents, should ensure appropriate outdoor play yards are provided in preschools for children's full development and academic learning, especially children with physical disabilities; as well as for school readiness of preschoolers. The Malaysia Ministry of Education should make it mandatory for preschool operators to implement outdoor play yards in their preschools, and to incorporate more UD features for equity to children with physical disabilities. Moreover, the standard of PPE should be established in ECCE curriculum to optimize children's learning environments in response to the MOE's goal of providing preschool education which is easily accessible and of better quality for the full development of children under

MEB 2013–2025 [10]. This study also has academic values in applying the PLS-SEM method to analyze empirical data collected from Malaysian preschools located in Kuala Lumpur and Selangor. For generalization purposes, further research with larger samples from other states in Malaysia, such as Johor, Negeri Sembilan, Melaka, Pahang, and Perak, should be replicated by using the same technique to provide additional evidence on the effects of outdoor play yards and outdoor play on school readiness consisting of more than one indicator.

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