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Integration of play therapy through architectural design strategies for children with physical disabilities

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ABSTRACT

Physical disability makes it hard for a person to take a walk, run, watch closely, and do other usual life tasks. Similarly, being mischievous is something that is expected to be part of a child's nature. Fun encourages all children to have an opportunity to be united with others of the same age. The analysis of various types and elements of physical disabilities in children including the rationale of play therapy, enables to identify the significance of the program to their development. Play therapy is highlighted among other strategies to be used in enhancing inclusivity while gaining the interest of a child, thus increasing the overall result and experience of a child-oriented program. This research will focus on evaluating the use of play therapy to create better ergonomics and an atmosphere that is friendly to children with physical disabilities, particularly through the use of architectural design strategies. The study will be conducted by interviewing professionals in play therapy and reviewing and analysis of the literature to see what the building design features include. A case study on the precedent buildings shows the different types of rooms and design strategies for play therapy in them through factors like layout, wayfinding, ventilation, lighting, and outdoor and indoor play areas. Thus, the research results in the core design parameters to be considered while designing the center that will be used in the provision of the play therapy program for children with physical disabilities.

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1. Introduction

Physical disability and impairment affect the mobility of people and impact their lifestyle, education, and development throughout their lives. Physically disabilities can be categorized into four, which are upper limb disability, lower limb disability, manual dexterity, and disability in the coordination of internal organs. From the Department of Statistics Malaysia [1], statistics have shown that there has been a steady climb in the number of registered persons with disabilities, with a total of 497,390 in 2018, and 23,836 people are of ages below 18 years old. Physical disability is the largest category of disability, with a percentage of 36% in Malaysia, and

41.2% in Penang alone. Children with impairments however are at greater risk of being isolated by their peers, who are without disabilities [2], which is fundamentally important to the healthy development of a child. This is due to stereotypes and prejudices in the society and failure of inclusive designs which escalates social barriers and challenges in their daily lives. Though health conditions may be a barrier to this, there is a great possibility for playful activities to be implemented into therapy sessions for a more effective and fun experience [3].

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Nomenclature:

C_p	specific heat ($\text{J kg}^{-1} \text{K}^{-1}$)
G	gravitational acceleration (m s^{-2})
K	thermal conductivity ($\text{W m}^{-1} \text{K}^{-1}$)
K_r	thermal conductivity ratio, $k_r = k_w/k_f$
L	length of the enclosure (m)

Greek symbols

α	thermal diffusivity ($\text{m}^2 \text{s}^{-1}$)
β	thermal expansion coefficient (K^{-1})
ϕ	solid volume fraction
Θ	dimensionless temperature

2. Problem statement

This particular group of users face challenges every day due to their condition which affects a person's mobility, physical capacity, stamina, or dexterity. One of the biggest vulnerable minority groups in Malaysia are considerably people with disabilities [4]. Children with disabilities may not just have physical impairments, temporarily or permanently, but there is a wider scope in the types of disabilities, such as cerebral palsy, acquired brain injury, spinal cord injury, and more [5]. Most community-based rehabilitation (CBR) centers in Malaysia are considerably not conducive and fully equipped compared to privately-owned rehabilitation centers and special needs schools located in developed countries. From a study by [6], Malaysia, similar to other developing nations, has responded to the lack of relevant professional resources by establishing midlevel programs. Some of the rehabilitation centers do not fulfill the safety and health requirements which brings hazards to People with Disabilities [7]. The Memorandum on Disability Issues for the 9th Malaysia Plan [8], it is stated that currently children are grouped with adults of all ages within CBR services which operate more like half-day care centers. Therefore, this limits the period of usage and amount of activity space in a center to be fully utilized for the rehabilitation of its tenants. In conclusion, the experiences and difficulties that disabled children and adults live in Malaysia present a need for rehabilitation facilities and services to be better in all aspects. There is a wide variety of disabilities affecting mobility, physical capability, and more, thus demanding the inclusion of full-equipped community-based rehabilitation centers. Current inadequacies in safety, resources, and age-appropriate programming make it imperative that comprehensive reforms occur so that every person can be provided with supportive environments conducive to rehabilitation and holistic well-being regardless of ability.

3. Research aim

This study has two objectives, firstly to explain effective design strategies that integrate play therapy, aiming to enhance ergonomics and create a conducive environment for the development of children with physical disabilities. Secondly, it provides valuable recommendations for design strategies and play therapy spaces, serving as a useful guide for designers and architects involved in the planning of Community-Based Rehabilitation (CBR) centers. The specific research objectives include identifying the behavior patterns of children with physical disabilities due to limitations in sensory and mobility and proposing architectural design solutions that incorporate play as a therapeutic approach. These solutions involve the integration of activity modules and dedicated spaces to improve the overall performance and productivity of rehabilitation for individuals with physical impairments.

4. Literature review**4.1. Disability in children**

Every single child grows and develops at different rates and in different ways. Some are born with special needs that can affect their growth

development, while some children may not show developmental problems, delays, or differences until much later in their childhood [9]. Children with disabilities or other special needs may display and develop unique challenges, but the care, curiosity, and need to communicate are similar to any child. Children with disabilities are children with health conditions such as cerebral palsy, muscular dystrophy, Down syndrome, traumatic spinal cord injury, and children with hearing, visual, physical, communication, and intellectual impairments [10]. Notably, there are several children with just a single impairment while others may experience multiple impairments. Malaysia's Ministry of Women, Family and Community Development (MWFCD) has stipulated physical disability to be the permanent inability of parts of the body whether caused by loss, absence, or the inability of any part of the body, which can affect their functions in fully carrying out basic daily activities. The condition can be acquired, which is a result of injury, or maybe congenital, which can occur as a disease in the body systems that cause malfunctions.

4.2. Education and rehabilitation center

In childhood care for children aged 6 – 17 years old, the Special Education Regulations are applied and restricted to children who are deemed educable. The term educable here is defined as a child who manages him/herself without help and is confirmed capable by a panel of medical practitioners, an officer of the Ministry of Education, and an officer from the Department of Social Welfare [11]. However, children with disabilities who are; physically handicapped with mental ability, with multiple disabilities, or with severe mental retardation, do not meet the eligibility criteria and will be referred to CBR centres. Therefore, children with physical disabilities in Malaysia nonetheless are forced to comply and receive their education and care through CBR programs. CBR centres also conduct rehabilitation programs which are cross-sectoral activities and may be provided by health professionals in conjunction with specialists in education, employment, social welfare, and other areas [12]. Through CBR, individualized care specifically caters to the needs of each person with disabilities [13].

4.3. Play and play therapy

In designing play therapy areas for children with physical disabilities, principles of inclusive design are paramount in accommodating diverse needs. From resources like 'Inclusive Design for Play' by Theresa Casey [14] and 'Universal Design for Learning in the Classroom' by Tracey E. Hall [15], architects can extract much-needed knowledge regarding the creation of an environment that caters to a whole range of abilities. Other books, such as 'Designing for Autism Spectrum Disorders' by Kristi Gaines and Angela Bourne [16] provide considerations in sensory sensitivity, which is relevant to children undergoing play therapy. In that same vein, 'Play for All Guidelines' by Robin C. Moore and Herb H. Wong [17] offers practical guidelines and actual cases regarding inclusive play environments, while 'Therapeutic Landscapes' by Clare Cooper Marcus and Naomi A. Sachs [18] informs on environments that can provide healing adapted to interiors for play. 'Sensory Design' by Joy Monice Malnar and Frank Vodvarka [19] underscores the importance of sensory experiences in the

design of buildings, while 'Architecture for Children' by Sarah Scott [20] underlines the importance of spaces targeted to young users. Finally, 'Design for Kids' by Debra Levin Gelman [21] offers insights on creating engaging experiences applicable to digital and physical design realms. Play is ultimately a child's world. Learning and development are best developed and enhanced through play [22]. Play is not only of physical development importance but further helps infants acquire executive function and cultural nuances within a safe environment [23]. The play was formally discussed in the 1900s as a method of therapy for children [24]. The term 'play therapy' was coined to be recognized as a medium for communicating with children using a wide range of play techniques [25]. Accommodations for children with physical disabilities are needed, which may involve adaptation of toys and the surrounding environment [26]. Although everybody benefits from play therapy, it is especially appropriate for children ages 3 to 12 years old [27, 28, 29]. Approximately up to 71% of children referred to play therapy may experience positive change [31]. The potential benefits of play therapy include alleviation of anxiety, expression of feelings, stronger social skills, improved fine and gross motor skills, etc [32].

4.4. Play therapy approaches

The first recorded use of therapeutic play goes back to 1919 and was evolvingly explained by several psychological theories [33]. The most important contribution to modern practice is probably by the work of Virginia Axline in the mid-20th century, through two major approaches, which were 'non-directive play therapy' and 'directive play therapy'. Play therapy since then has evolved rapidly and is described widely by different researchers, thus bringing forward various methods. McMahon [34] compiled various records of play therapy throughout the years and refined the categorization of the development of play in children, particularly toddlers, into three: Sensory and Physical Play, Exploratory and Social Play, lastly Symbolic and Pretend Play. Sensory and Physical Play exposes the child to the surroundings in which he/she can use the main senses, such as touch, taste, feel, seeing, and hearing, traditionally, or with assistive technologies, like Virtual Reality. Exploratory and Social Play is described as when the child learns to play actively, either individually in separation or collectively with their peers. Last but not least, Symbolic and Pretend Play allows the child to transition from loss or absence through imitation of toys or to imitate actions through role-playing. For this study, these three methods of play therapy are adopted and used throughout the research.

5. Designing therapeutic architectural spaces: Integrating healing elements for holistic well-being

In the broader field of architecture, integrating therapy into design necessitates a deep understanding of how various therapeutic elements can be seamlessly incorporated into architectural spaces to promote well-being and healing. Each therapeutic component, such as natural light, color psychology, biophilic design, and sensory stimulation, requires careful consideration of specific design requirements. For instance, the strategic placement of windows and skylights can optimize natural light exposure, fostering a sense of comfort and connection with the outdoors while meeting the practical need for illumination [35]. Similarly, incorporating calming color palettes, inspired by principles of color psychology, can evoke desired emotional responses and support relaxation within the space [36]. Biophilic design principles advocate for integrating natural elements such as plants and water features, which not only enhance aesthetics but also contribute to stress reduction and improved cognitive function [37]. Furthermore, attention to sensory stimulation involves the thoughtful selection of materials, textures, and spatial layouts to engage occupants' senses positively. By meticulously

integrating these therapeutic elements into architectural design, practitioners can create environments that holistically support users' physical, emotional, and psychological well-being, ultimately fostering healing and restoration. Design Strategies

From the 'Garis Panduan Perancangan Kemudahan Masyarakat' [38], the guidelines for designing a CBR Centre are observed to have a list of required minimum space components, however, only the specified minimum sizing of space stated is for the activity area (90m²) and several other spaces not relevant to play therapy. It is also stated that the minimum floor area is 1600m² and the minimum activity space area for a person is 3m², which is dependent on the feasibility and suitability of the premise.

On the other hand, the space typology of each play therapy approach is loosely mentioned by therapists. For example, *Sensory and Physical Play*, requires more specified rooms, both outdoor and/or indoor, such as a sensory room, playroom, or hydrotherapy pools. *Exploratory and Social Play* and *Symbolic and Pretend Play*, require more flexible large spaces for the children to be in. This can include an indoor gymnasium or even in an outdoor setting.

Designing for children is different from the normal standards because spaces, products, and processes designed for children are needed to be more effective and safer, especially for the younger age [39]. Ergonomically designed adaptations, like railings and access, and functional spaces will enable an effective area catered for a specific range of users. To develop this effective design, the measurements of the design itself, viable through the correct anthropometric data, need to fulfil the needs of the user, especially when they need special requirements, such as children with physical disabilities.

6. Methodology

The primary approach used to complete this study is through the qualitative research method. This includes semi-structured interviews to understand the behavior of children with physical and developmental disabilities, and the implementation of play therapy in reality. Secondly, a precedent study is conducted on two institutions to understand and evaluate their play therapy space integration. The secondary research approach is through a desk review of data collection from reputable journals, articles, books, and online websites to further support the previously discussed literature review and overall research.

6.1. Data Collection from Semi-Structured Interviews

The semi-structured interview is conducted with teachers/trainers and professionals in the industry, to gauge their knowledge in the field of physical disability and the incorporation of play therapy at their respective schools/centers. Table 1 below lists the semi-structured interview questions directed towards the respondents.

Table 1. Semi-structured interview questions.

Question 1	What are the current therapy activities implemented on the children during rehabilitation and are they satisfactory?
Question 2	Based on your experience, what are the reactions of the children during their therapy programs?
Question 3	What are the adaptations to the center that help with the capabilities and limitations of the children?
Question 4	How is play therapy included in the therapy programs in the center or are there any specific types of programs just for play?
Question 5	Are there any specific spaces or areas for these play therapy activities?

Question 6	What is the behavior of the children towards play therapy?
Question 7	In your opinion, does play therapy significantly help children in terms of their capability development?
Question 8	What do you think can be further incorporated as part of play therapy into the center as part of the therapy program, in terms of architectural design?

Table 2. Selected precedent study buildings.

Building	Cerebral Palsy (Spastic) Children's Association	J. P. Lord School
Year	1962	2018 (relocation)
Type	Physical disability (spastic cerebral palsy (CP)) (0-25 years)	Complex multiple disabilities, such as physical and cognitive disabilities (5-21 years of age)
Reason	<ul style="list-style-type: none"> One out of only three CP centers in Malaysia. First sensory room application in the country. 	<ul style="list-style-type: none"> First building in the nation solely for a special school for multiple disabilities. 2019 Illuminating Engineering Society Annual Conference "Special Citation Award" (lighting)
Type of therapy and activities with play	<ul style="list-style-type: none"> Sensory-Perceptual-Motor Training Bobath approach Sensory integration Daily morning exercise Computer-aided activities Swimming Visual/ performing arts Life skill play 	<ul style="list-style-type: none"> Multi-sensory activities and programmes Sports activities (indoor and outdoor) Swimming Creative play Arts and music programmes Literacy and language Life skill play

6.2. Data Collection from Precedent Studies

The analytical study is carried out on two buildings that implement play as part of their curriculum and activity, indirectly and directly. The two institutions are selected for several other criteria, which are:

- Has reputable material from online research and insight from the administration.
- Has a variety of services for children with physical disabilities.
- Acknowledgement for building design.

Table 2 shows the chosen institutions, which are Cerebral Palsy (Spastic) Children's Association, located in Penang, Malaysia, and J. P. Lord School, located in Nebraska, United States of America, and its characteristics of selection.

7. Finding and discussion

7.1. Demand for play therapy

The semi-structured interviews are conducted with several professionals in fields that make up play therapy, such as physiotherapy, speech therapy, and child psychology. Table 3 summarises the overall outcome of the interview sessions. The responses of the experts can be found in Appendix A.

Table 3. Analysis of the semi-structured interviews

Question 1	Therapy programs are curated specifically according to the needs of the child, and not being summed up according to the majority. Some therapy sessions use an integrated approach.
Question 2	The reactions towards the therapy session depend on the condition or severity of the children. Reactions depend on the time and period of the session, which may influence the state of emotions the child is feeling at the point of time.
Question 3	Design to the standard universal design. A more structured approach in organizing the appropriate learning or life skill tools and adaptive tools in a space can influence the overall comfort level of the children.
Question 4	There is more than one approach to play therapy, depending on the child's needs. Play therapy can be integrated into daily life activities/routines or using clear play therapy methods
Question 5	Play therapy uses both specific functional rooms and/or flexible large spaces.
Question 6	Play therapy allows positive engagement during sessions, but also depends on the child's severity, emotional state, gross motor skills, and preference.
Question 7	Implementation is highly agreed to increase motor skills, communication development, cognitive abilities, and concentration level of the students during classes
Question 8	The promising goal towards gradually implement more play areas and rooms in their center or school, including high-end technology, inclusive devices, and adaptations to public environments.

The adaptation of play therapy in special needs schools and rehabilitation centers is essential to the development of children. Their limitation and extent of capabilities in daily life activities are also what play a part in their severity and overall condition. This is where play therapy comes in to keep the student eagerly engaged throughout their sessions. Play therapy can be implemented during main therapy sessions, such as occupational therapy and speech therapy sessions, or it can be conducted as a sole activity session, such as through sensory integration sessions. Therefore, proves that more play therapy activities are in demand to be included in their syllabus and centers. Analysis from Precedent Studies Based on the summary analysis findings from the precedent studies (Table 4), several design elements are evaluated to understand more about the architectural design strategies for designing play therapy, such as layout, wayfinding, ventilation, lighting, and lastly indoor and outdoor therapy/activity spaces design. The Cerebral Palsy (Spastic) Children's Association's layout locate most of their classrooms, activity rooms, and therapy rooms on the ground floor to ease the movement of the students. In terms of wayfinding, a color-coding system for the classrooms and therapy rooms, with brightly colored

exterior and interior wall finishes to the window and door frame and storage elements, to help the children clearly distinguish their required classroom and help the students in their cognitive skills and independence. The center promotes natural ventilation, through louver panel windows and cross ventilation, while mechanical ventilation is applied at high-capacity activity rooms, such as the gymnasium and hall. Natural daylighting is also promoted through the large panels of windows, while conventional fluorescent lights and/or recessed LED lighting are installed to supplement the illumination in the spaces. As for the indoor play spaces design, the Sensory Integration unit gymnasium is furnished with bright blue foam mats while the side walls are covered halfway with bright blue crash mats for safety during programs. The room is equipped with soft-foam platforms, log swings, trampolines, enclosed small spaces, and adaptive toys for the child's development therapy activities.

Table 4. Summary of spatial design from precedent study buildings.

Building	Neural Palsy (Spastic) Children's Association	J. P. Lord School
Layout	Main rooms on the ground floor	Single storey layout
Wayfinding	Colour-coded rooms Railing system	Sensory nooks Art trail Ceiling lighting trail
Ventilation	Natural and mechanical	Mechanical
Lighting	Natural and artificial	Natural and artificial
Indoor play area	Sensory integration unit Snoezelen room Art and cultural room Games room Multipurpose hall Hydrotherapy pool Computer-assistive classroom	Sensory gymnasium Snoezelen room Art and music rooms Multipurpose hall/cafeateria Hydrotherapy pool
Outdoor play area	Greenfield Farming garden	Hard surface play area

The center is also house to the first-ever multisensory room, or Snoezelen room, in Malaysia, which is considered to be more than 20 years old but is currently in need of an upgrade. A games room is set up with additional floor mats, ergonomic-friendly round tables for game playing, gym balls, a tepee, trampolines, and a games storage area. The indoor multipurpose hall/gymnasium is approximately 280m² and can accommodate around 100 pax comfortably. Music and performing art exploration activities are held at the multipurpose hall's stage area and the art and cultural room. The hydrotherapy pool has approximately an area of 90m² with 5 laps. The area is naturally ventilated and maximizes daylighting with a changing room and toilet just adjacent to the pool area for the ease of the students. Sessions are a weekly routine for the students as part of their therapy program. As for the outdoor play therapy and activity spaces, the center has a large green field that is used flexibly. Events, sports activities, and workshops are held on the field. Lastly, the farming garden exposes the students to sensory play to increase motor skills and social skills with the center's volunteers. Figures 1 and 2 show some of the indoor play areas in the center. J. P. Lord School is a single-story building and is designed to create a conducive environment to allow each student to maximize their full learning and developmental potential. One of the wayfinding element designs incorporated at the school is large accessible hallways with 'sensory nooks'

and resting areas using bright colors and artworks, including a guiding railing system. The bright lighting and additional star-shaped ceiling lighting allow the student to explore the space and stimulate their senses while traveling. The school mainly uses mechanical ventilation by using a conventional HVAC system for a more regular ventilation process throughout the whole interior space. The school adopts natural daylighting through large glazing and high clerestory windows. For artificial lighting, walkways and entryways feature LED lighting using colour-changing elements, through interactive, tactile applications for a multi-sensory experience.



Figure 1. Sensory gymnasium and games room.



Figure 2. Multipurpose hall and Hydrotherapy pool area.

As for the indoor play spaces design, the Snoezelen room is equipped with fiber optic lights, bean bags, soft seating, interactive projectors, and bubble tubes, which stimulate the students to keep them alert and engaged and also help to develop their motor and social skills. Next, the sensory gymnasium includes adaptive equipment designed to help students move and exercise, through fun therapy equipment, such as play mats, crash pads, soft foam play elements, motorized small vehicles, and platform swings. The facility also dedicates multiple art and music rooms for the students for exploratory play. A zero-entry hydrotherapy pool, with a raising floor system and an underwater treadmill, is installed as part of sensory and physical play.

Lastly, the outdoor play space has a large, blacktop baseball diamond on a flat cement screed floor finish which allows students to experience more physical play with their peers. Figures 3 and 4 show several indoor play areas in J. P. Lord School.

7.2. Requirements of Play Therapy Through Design

The implementation of play therapy depends on the type of disabilities experienced by the children to assess the range of severity and medical condition of the child. However, the next crucial item is providing the correct spaces with equipment that is ergonomically friendly for the users. From the precedent studies, it is analyzed that there are similarities in several spaces implemented, such as the sensory gymnasium, Snoezelen room, art and music rooms, multipurpose hall, hydrotherapy pool, and outdoor play area. The types of rooms to be included at a CBR center based on guidelines in [25], that relate to play, are Snoezelen room, audio-visual room, multipurpose room, activity space, and outdoor recreation or playground. These rooms coincide with the essential space/room types analyzed above, which proves the necessary rooms stated to be required in a CBR center. Primarily, the only room directly related to play therapy

specified in the same guidelines is the activity room, with a minimum sizing of 90m². Therefore, an outline of a design for the activity room is developed for this research (Figure 5). The proposed design is suitable to be implemented for a CBR center or a special needs school as it executes the basic requirements of an activity room with play activities and is ergonomically designed to suit children with physical disabilities. The design of the 9m x 10m activity room features the basic amenities required to conduct all three types of play therapy, including an additional interactive display unit for audio/visual activity.



Figure 3. Snorezen room and sensory gymnasium



Figure 4. Music room and Hydrotherapy room

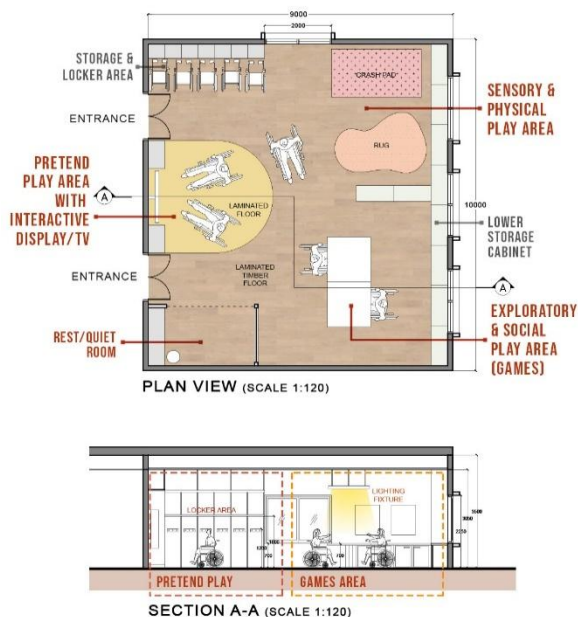


Figure 5. Plan and section of the proposed activity room by the author. The sizes of other rooms may be up to the centre or school's budget and requirements of the curriculum. Nevertheless, a centre.

A wheelchair storage and locker area and a quiet room are allocated for ease of storage and intermittent relaxation, respectively. . The Sensory & Physical play area has a mixture of floor surfaces, such as a rug and crash pad, for different sensory activities and the safety of the children. The Exploratory & Social play area has ergonomically designed tables for the children to play games and learn comfortably. The height of the table is 70cm from the floor, a length (span) of 120cm and a width of 100cm, suitable for children of all severity, including those who are bound to wheelchairs. A designated lighting fixture for this area is also designed to define the space. The Pretend play area has a colored laminated floor finish to define the area and is allocated for performance too, whenever needed. Each space has its ample storage area to maintain a clean and tidy area for the activities, and at the same time, is movable to flexibly use the space for larger group activities.

8. Conclusion

To answer the first research question, it is imperative to recognize that disability varies depending on each person. All children, including children with disabilities, deserve quality childcare programs, specially catered to each child. Undoubtedly, play therapy comes in because play is essential for the development of the child in every area, especially motor, cognitive, emotional, and social skills. Architecture and design play an important part in providing a comfortable and suitable space that allows each type of therapy to be conducted effectively. Answering the second research question, the suggested types of spaces for play therapy are a Snorezen room, sensory gymnasium, art/music room, multipurpose hall, and hydrotherapy area. Design requirements explained, especially the activity room, are the necessities for a center, serving physically disabled children to serving physically disabled children to be productive for the development of the students. The introduction of play therapy into architecture is still limited and causes a wide range of research gaps to be explored in the future. Though analyzing the case studies and the questionnaire results the research is providing a guideline for the architectural project design, however, future research could focus on the technical aspects of designing these specified spaces, which is considered one of the limitations of the study due to the time constraint. The findings of this study contribute to the knowledge that exists on the subject of rehabilitation services for people with disabilities within Malaysia. First, the study focuses on the specific challenges facing this vulnerable minority group in the context of community-based rehabilitation centres. It adds to the existing context of inadequate infrastructure and resources within the CBR centres. By explaining the difference between publicly funded CBR centres and privately owned facilities, we reiterate the urgent need for systemic improvements in the rehabilitation sector of Malaysia. At the same time, our research demonstrated that there exists a lack of age-appropriate programming within CBR services as children with disabilities are mixed with adults, which tends to affect the rehabilitation process. This is a new insight that draws attention to tailored rehabilitation programs that should be able to meet the varied needs of persons with disabilities. It, therefore, advocates for more inclusive and comprehensive services. In essence, our research provides a detailed understanding of the deficiencies in the rehabilitation landscape of Malaysia and calls for targeted interventions to fill such gaps and improve accessibility and the quality of care for persons with disabilities.

Authors' contribution

All authors contributed equally to the preparation of this article.

Declaration of competing interest

The authors declare no conflicts of interest.

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Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Appendix A

Semi-structured Interview Findings and Discussion

The semi-structured interviews are conducted with professionals of several fields that make up play therapy. Three different respondents were interviewed from different fields, which are physiotherapy, speech therapy, and psychology, respectively. Respondent A is a male and the Head of Physiotherapy at a center, while Respondent B is a male and a Principal Speech Therapist, Manager of the Allied Health Sciences cum Early Intervention Programme Manager. Lastly, Respondent C is a female and a Child Psychologist cum teacher at a children's disability center. The responses from the interviewees from each session are recorded, transcribed through Otter.ai software, and analyzed by using the Atlas. ti software.

Question 1

What are the current therapy activities implemented on the children during rehabilitation and are they satisfactory?

Respondent A:

"The center uses an integrated approach, called the 'Bobath approach' for neurodevelopmental therapy. The design (of the therapy) is to see small change (in the students) and progress towards bigger changes (and) more functional abilities"

Respondent B:

"(The school) has a transdisciplinary approach to intervention, which means that we work together as teams, we plan, and we do our planning and programming. As part of a team, we try to share common intervention goals. For example, physiotherapists and occupational therapists can work together, and to provide more targeted and strategic intervention, ... and play happens to be part of this as well"

Respondent C:

"Based on my experience working with these children and implementing Applied Behavioural Analysis (ABA), therapy activities vary. It varies between centers, and it varies between therapists and children. Most of the activities we implement are individually tailored to each child's needs. There are a lot of plays that can be done according to a child's capabilities, such as pretend play, structured play, explorative play, sensory play, and even arts and crafts. In all those plays, there would usually be some vocal plays too. Some therapists should be more flexible to allow the children enough autonomy to play their way as long as it does not result in disruptive behavior"

The current therapy interventions being carried out in reality as compared to the ideal situation are quite different whereby based on the respondents' answers, the therapy sessions being implemented vary based on the student or child's severity and age. The therapy is being carefully curated and planned specifically according to the needs of the child, and not being summed up according to the majority of a group of children. Based on Respondents A and B, both of them apply an integrated approach whereby different categories of therapy, such as occupational therapy, speech therapy, and physiotherapy, come together to create a suitable integrated therapy approach best suited for a child. Therefore, this approach allows the child to explore more in a session, but at the same time allows a slow but constant positive progress in life skill development.

Question 2

Based on your experience, what are the reactions of the children during their therapy programs?

Respondent A:

"It all depends on the severity and sensory issues of the children. Some will cooperate from the first session, while some, (especially) children with vision problem and sensory problems, take more sessions to get some progress."

Respondent B:

"Because our therapy programs are targeted to the child's needs, and take into account the child's interests, usually the children are happy and engaged during the session. Happy is more subjective, rather more purposefully okay (with the session). Yeah, but I suppose we do have a small percentage of children who have difficulties being engaged. The primary reason is basically that either they have too many complex things, like physical difficulty, intellectual deficit, or sensory needs which can be quite intensive, which would be reasonable."

Respondent C:

"There's been a lot of laughter, screaming, jumping, crying. It has a mixture of both positive and negative reactions. Once the child is engaged, demands are slowly added in. Something as simple as "Let's throw the ball into the basket". However, if the child is having a problem in behaving, as they come in, we are required to find out the cause of the behavior, the function of the behavior, and what we should do to manage it. When the child has successfully calmed down, we often reward with low preference play/toy or something neutral. Some days, they will laugh, they will comply with your instructions well, and no problematic behaviors observed. (Therefore), it varies among the children, the activities conducted, and it even varies each day."

All three respondents conclude that the reactions towards the therapy session depend on the condition or severity of the disability of the children. A severely impaired child may behave differently from an alert child, due to the difference in capabilities even when they are in the same therapy session period. This is also why the therapy session is highly dependent on the state of the child and cater specially for him/her. Respondent C also added that a child's reaction may depend on the time and period of session which may influence the state of emotions the child may be in at the point of time.

Question 3

What are the adaptations to the center that help with the capabilities and limitations of the children?

Respondent A:

"(The center) is universally designed, by providing ramps and railings. Most classes and therapy rooms are on the ground floor (to ease the students)."

Respondent B:

"In the early intervention program, we have learning spaces when in physical space to be well structured, so that it makes more meaning to the child. For example, there are very clear play areas, and the work areas, for example, washing hands, are well distinguished so it is very clearly organized. The physical organization of the physical space is something that we do for all the programs that we have, so it becomes very clear for the child where specific spaces are used. The second thing is we also provide additional information from the child in terms of the environment. This could include preschools having visuals at different spaces, having timetables, that help understand what happens through the activities, also modifying activities that are created in a personalized way addressing the child's preferences, interests, and needs. Some other devices, for example, for children with multiple disabilities, we may have seating devices, and could also include things like splints, which are adaptive utensils. So again,

the idea is that we adapt the environment so that the child can perform towards independence and meaningful participation”

Respondent C:

“The center I worked for uses ABA methods, as I believe many other centers do as well. Each child has an Individualized Education Plan (IEP). Before creating the IEP, assessments are done on each child upon enrolment to determine what skills they have and do not have. Sometimes to determine what skills they need help improving. After a certain period, the child will be assessed again to see what they have improved and how can we help the child further. The IEP will consist of many different programs that cover different areas (speech, manding, play, reading, etc.).” The standard universal design for a child rehabilitation center or special school is inevitable, as stated by Respondent A. However, Respondent B’s center stresses the appearance of the space itself to be more approachable for the student. A more structured approach in placing and organizing the appropriate learning or life skill tools in a space can influence the overall comfort level of the children. Specialized adaptive tools, like splints and mobility devices, as mentioned by Respondent B, are also good for the students to be more independent and learn lifelong skills. Respondent C however believes instead of modification of the environment, a more adaptable or individualized set of activities being planned for the child is a better approach to induce a faster improvement in their development.

Question 4

How is play therapy included in the therapy programs in the center or are there any specific types of programs just for play?

Respondent A:

“When we do therapy, we give toys based on the age and how the child plays and approaches the toy. We also see how the child is impacted by the toys, in symbolic play and other types of play, the speech therapist and teachers will be engaged (together with the child). The (other) types of play used depend upon which department is involved, such as for symbolic and imitation play.”

Respondent B:

“So, we don’t have play as a stand-alone. Play is part of the child’s environment. Therefore, the focus of early intervention and reinforcement learning is to provide functional opportunities to the child. We have more functional outcomes in routine settings so that play is a part of the routines of daily living activities and challenges. For example, moving from one area to another, or brushing their teeth. Typically, if you study a child, there are a lot of activities that cause difficulties for a (disabled) child. So, we introduced the same kind of activities for the child in the classroom. Play is embedded in each phase of intervention.”

Respondent C:

“Play is often used as a reward to encourage certain behaviors. Sometimes play is even used as a teaching method. Whether it is simply to add to their play skills, teach about animals, shapes, other common items (balls, swing, balloon, etc.), or even to teach them how to appropriately ask for what they want.”

Respondents A and C use a clearer play therapy approach with more physical play, symbolic and pretend play, and also exploratory play. Toys are mainly used to approach the child to engage in the class better instead of a conventional therapy session through speech communication. On the other hand, Respondent B uses a more subtle approach to play therapy by embedding play in daily activities and routines during classes and therapy sessions. This results in a functional form of the session instead of just play, but at the same time incorporates fun elements for the child to be in a

constant better concentration level. This shows that they are more than a single approach to incorporating play therapy at centers and schools, depending on the needs of the child.

Question 5

Are there any specific spaces or areas for these play therapy activities?

Respondent A:

“Depending on the type of play therapy approach, the center (includes) a swimming pool, where we have separate hydrotherapy sessions, as well as speech-inclusive play in classes. Physical play is not much conducted outdoors as there is no specific playground, just a field, but we do have morning exercise routines. We also have a sensory room, which is actually the first one being set up in Malaysia and is over 20 years old, but needs an upgrade and is quite expensive at the moment.”

Respondent B:

“Yes, we do have a playground. Some of the playground equipment is adapted, so that it is easier for kids with varying levels of physical capabilities () to engage with the playground equipment and materials. We do have a courtyard, where older students have more strenuous physical activities, like running and soccer. We also implement concepts in learning spaces, (which is) a room that has different stations of different types of toys to engage and interact with the different toys and other people’s responses. We also have Sensory Learning, through a sensory-motor gym, sensory room, which was like lights and different visual, tactile and auditory stimulus, hydrotherapy, etc.”

Respondent C:

“No. We are free to use anything and to go anywhere that is available. This is important to make sure the child can generalize the skills they gained from the plays. A child needs to know that a basketball hoop in the classroom and the playground serves the same purpose. Colored pencils with a coloring book in the classroom, and outside. A chair in the classroom and outside, and so on.”

Respondent A and B’s work environment adapts clear spaces for the intervention of play therapy, such as classrooms, swimming pools, fields, sensory rooms, etc. This allows the children to expertly know the purpose of the room or space and provides a distinct set of guidelines and rules for the children to understand when in the space. For example, the purpose of the sensory room may be to increase the stimulation of motor sensory skills of a child in the eyes of a trainer, however, for a child, the room is a space where they can relax and play, thus, providing a safe place for the child to release their emotions during therapy session. Respondent C’s workplace however implements a more flexible approach for their play therapy, whereby the children are taught to understand that play can be adopted anywhere. This approach diminishes the limitations of a child with disabilities to see the world in a more positive light and provide more inclusivity in society. It is best to say that play therapy can be approached in several ways, either with fixed purposeful rooms or through flexible spaces, even outside the grounds of the school or center.

Question 6

What is the behavior of the children towards play therapy?

Respondent A:

“During therapy, when the children are given toys, etc., it is easier to conduct the therapy (session). (It is because) the students were more engaged and interested in the class. The only thing is that the teachers and trainers should know how to get a (positive) output from the child within the time given”

Respondent B:

"I have to clarify here; play is one part of the curriculum here. Different children play differently. So, the goal is to understand the child's baseline skills, in cognition, motor senses, and all (other) areas, like language communication, to target the right kind of play for each child's level. That is our goal to get them (be) engaged in play. But we also acknowledge that our center serves children from more moderate to severe in terms of their functioning, and sometimes for them, that play is very different from what play you observe. So, (for) most of them, we do more of a functional-cause-effect kind of play. Most of the time, they do not engage with their peers, so they must get into their world, engage them, and then start playing. Play one of the things that is one of the gifts that kids can engage with, and each kid has a specific baseline for those that we support."

Respondent C:

"Behaviours depend on a child's preferences. A child who does not like sensory play would most likely whine and push away the sand if you ask them to touch it. A child would engage for more than just a few seconds playing with the swing if that is what they like. They would even laugh and smile and ask for more. Even though the behaviors vary, most children would prefer to play over table time. Table time (approach in education) consists of a lot of demands and play only comes as rewards and for a short period."

All three respondents agree that play therapy can increase the engagement of the child during therapy and also positively influence their concentration in class. However, this also depends on the state of the child's severity, emotional state, gross motor skills, and preference.

Question 7

In your opinion, does play therapy significantly help children in terms of their capability development?

Respondent A:

"Obviously, in all aspects, even during class and therapy (sessions). It helps the children in comparison with normal therapy, so play therapy significantly helps the children more."

Respondent B:

"Yes, you're right. Play is a foundational activity that supports a child's gross modifiable motor, cognition, and communication skills. So, it is very important to focus on more meaningful plays because a child is more engaging and participating (during their sessions)."

Respondent C:

"Yes. One (session of) play can help children with their speech, gross motor skills, fine motor skills, and more. One play (session) can cover many areas in a child's development."

All three respondents highly agree that play therapy does significantly help children in terms of the development of their capabilities. Play therapy supports and increases a child's motor skills, communication development, and cognitive abilities and, at the same time increases the concentration level of the students during classes.

Question 8

What do you think can be further incorporated as part of play therapy into the center as part of the therapy program, in terms of architectural design?

Respondent A:

"In the future, we have two (empty) spaces that can (be used) for the inclusive playground. This is to help with the children's physical ability, and motor and cognitive capabilities. Last time, we had the opportunity to build it but (unfortunately) there were not enough resources and support. (So) we would like to construct maybe an inclusive playground out of recycled materials."

Respondent B:

"We have to start looking at specific approaches for play therapy; to look at the different dimensions of play. For example, the occupational therapist has a take more floor time, and flow time, and look at how to develop playing (for) children who have very challenging behaviors. There is a floor time approach (and) a hands-on approach to play. So, integrating different approaches, and looking at how play can be targeted at a specific level is very important. I think, therapists, need to be trained specifically to understand the importance of play and how to engage and manage (during sessions). With the children, for example, to move them from one level to another level and to build up the competency is very important. Of course, having spaces that can provide very specific inputs to children who need targeted stimulation, for example, children who have (severe) difficulties, might need to have specific playing opportunities that provide these inputs in a very safe manner. Maybe not just having this in the school, but probably even in the community is very important. Besides that, we have yet to discover the possibility of incorporating virtual reality (into the curriculum). However, most of the time, supervision, adaptations, and modifications (for certain play elements) are needed to provide safety."

Respondent C:

"More space and equipment for physical play! The center I worked with had a small wall climbing section, a playground, and even a swing. Maybe more jungle gym kind of equipment would be good too. However, lights and texture play an important role too. Some children get fixated on bright lights and are often not able to focus on the task at hand. Some get fixated if the floor mat has a rough texture. However, regardless of what equipment (is) provided, accidents happen almost all the time. Urinating in their pants, vomiting, overspilling from diapers, falling, bumping heads, etc. So, I think the space and even the equipment need to be safe, and easy to clean, and the brightness of the lights is adjustable. Safe space also means big space. This is to avoid accidents between the children. Separate sections for different types of plays. Water and sensory plays would need a different space from sports play and arts and crafts. I also find it helpful that my center had half-concrete walls and half-glass. This is to ensure the safety of the children and therapists. If any accidents occur, someone from the outside would be able to see and assist accordingly. There must also be a space or a room for cooling off as these children can easily get overwhelmed with their surroundings."

All three respondents positively agree to gradually add and implement more play areas and rooms in their center or school. For example, Respondent A requires more physical play areas, such as an inclusive playground for his students, while Respondent B wants to include a Virtual Reality class in the future and hopes for a more structured approach for play therapy to be included in his school. The latter also includes encouraging other professions that makeup play therapy to extend their sessions and be trained to include more play sessions. However, Respondent C encourages and hopes her center can include more equipment and devices for play. The environment of the play space should also be ridiculed to ensure a safe and clean surrounding for the students to positively develop. Conclusively, this is a promising step for play therapy to expand in centers and schools and, at the same time, meaningfully evolve into society for more inclusive public facility designs in the future.