

## EFFECTS ON PRESCHOOL FURNITURE FOR PHYSICAL COMFORT OF CHILDREN *Aged between 2-5 years in Colombo area*

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**Abstract:** The study explores the impact of preschool furniture on the physical comfort of children, highlighting the significant role of the furniture in their physical comfort. The research focuses on ergonomics and sustainability of preschool furniture. This research is done using the research onion method by using all its layers, which are the philosophy, approach, strategies used, choices, time horizon and techniques and procedures. After analysing the data through questionnaires and case studies, the study shows that both ergonomics and sustainability have a positive impact on the physical comfort of children. But in Sri Lankan context there's less sustainable furniture in preschool so this area should be improved vastly. Whereas when ergonomics are considered, most of the physical ergonomics factors are considered when selecting furniture for preschool, but there are few minor improvements to be done to make the preschool furniture have a positive effect on the physical comfort of children.

**Keywords:** *Comfort of children; preschool furniture; ergonomics; sustainability.*

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### 1. Introduction

The purpose of this research is to investigate how the furniture of a preschool affects the physical comfort of children. The target group in this case will be private preschools and children aged 2-5 years old who live in Colombo. Preschools are educational institutes or learning environments that give children early childhood education before they begin school. In preschools, children combine study and play under the guidance of teachers who have received adequate training. The internal atmosphere of a preschool is where the children learn. As a result, the furniture should be both pleasant, comfortable and functional.

The physical comfort and well-being of children are significantly influenced by furnishings. It's crucial to choose children's furniture that fits them well and is built just for them. Children's furniture has various benefits that cater to their unique needs and requirements (Kriplani, 2023). Since children have no choice in selecting their furniture, they end up becoming passive users in the design process. In this paper, the aim is to understand the impacts that preschool furniture has on children's physical comfort (Teknologi, 2016).

Many psychiatrists have conducted related research, and as a result, architects worldwide are searching for methods to enhance preschool experiences for children. Preschools are supposed to look like tiny cities, with distinct areas, a variety of furnishings, and engaging activities that may be adapted to the creative imaginations of the children. Their physical comfort can be shaped by incorporating a set of furniture with appropriate ergonomics and sustainable design techniques (Bunge, 2017).

This research will provide fundamental in-depth information on the effects of preschool furniture characteristics like ergonomics and sustainability methods that promote physical comfort of children.

The term "ergonomics" comes from the Greek words *ergon* (work) and *nomos* (rule) and is defined as the science of human work. Its primary concern is to adapt the working conditions to the individual, and not the opposite (ErgoKid, 2016). Ergonomic furniture is made to enhance human function and comfort, lowering the risk of conditions including arthritis, constricted organs, back pain, neck discomfort, musculoskeletal disorders, and low blood pressure (Noton, 2019). Therefore, when it comes to preschools, it is especially essential to make furniture with ergonomics that allows the children to be physically comfortable.

Having sustainable furniture designs like incorporating nature, sustainable materials, sustainable design process etc. are other key aspects furniture should have for the proper physical comfort of children (Graham, 2019). In addition to being comfortable and convenient to use, people also require furniture that matches the external and interior design of the space. Newer, more adaptable and more comfortable materials are on the market to meet these needs. Every material has its unique properties and is employed to achieve objectives (Yashoda, 2018).

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The feeling of ease and relaxation someone feels in their physical environment or in connection with their body is referred to as physical comfort. It includes several aspects that promote comfort and a feeling of well-being. Overall well-being is greatly impacted by physical comfort, which also has an impact on mood, productivity, and the capacity to unwind and enjoy activities. Physical comfort is an important consideration when designing areas (Wilson, 2022).

The key objective of this study is to examine the effects of preschool furniture on the physical comfort of children. The additional goals of this research will be to examine the relationship between the ergonomics of furniture and physical comfort and to investigate the effects of sustainable furniture designs on the physical comfort of children in a preschool.

This research will benefit the public in many ways, including providing a better understanding of the effect of preschool furniture on the physical comfort of children for both interior and architectural students or designers, assisting preschool owners in determining the furniture for the preschool, and educating parents on the importance of furniture design on physical comfort of their children. Furthermore, this research will be useful for academic purposes, such as for those who want to conduct similar research.

The research was done assuming that all the participants in the study will answer the questionnaires honestly and unbiasedly. Since it would take a lot of time and work to verify each participant's responses, honest answers will be expected. Moreover, this research will represent two preschools which are the Bloom preschool in Piliyandala and Kidsdom Preschool in Nugegoda. Here it will be assumed that these two preschools represent all the preschools in Colombo for the ease of study. The need for this research is to provide trustworthy information and adequate insightful knowledge for future preschool organizations that are looking forward to starting up a new venture for children.

## 2. Literature Review

A preschool is an educational institution based on playing, singing, practical activities such as drawing, and social interaction as a part of the transition from home to school. It is the very first form of school education given to children aged 2-5. It is believed that creating a favorable environment that fulfills all necessary desires of children, like an appropriate interior within their surroundings can affect their physical comfort (Children, 2022).

Preschool furniture can be branched into ergonomics and sustainability.

### 2.1 ERGONOMICS

Ergonomics and anthropometrics are a must to discuss when referring to furniture arrangements. Beyond making children feel comfortable at school, ergonomic seating helps avoid postural problems and persisting aches and pains later in life. Children' growing bodies can be protected and their ability to concentrate on learning increases by providing them with ergonomic furniture in their learning environments. Children' feet need to be able to reach the floor, which is a major factor in choosing furniture that is the appropriate height. "It's recommended for kids to sit in chairs with both feet on the floor, not dangling, crossed, or sitting on one leg, and with knees bent at a 90-degree angle. Children should keep their necks "in a neutral position, not flexed forward or extended backwards" when looking up at the teacher or the board (Larson, 2021). As good postures begin to form at a young age, ergonomics is essential for healthy growth. Good posture has a significant impact on the children's overall health. For this reason, it is strongly advised to build ergonomic preschool furniture (Nordtømme, 2012).

One of the most important components of ergonomics in the classroom is an ergonomic chair and a desk. A well-designed chair should accommodate the 90/90/90 rule and provide ample lower back support, a back-to-thigh angle of ninety degrees, a knee angle of ninety degrees (Hendricks, 2020). Ergonomics for children are equally crucial as those for adults, if not greater in importance. Proper posture and ergonomic practices are essential for maintaining optimal musculoskeletal health as individuals' bodies grow and change (Hendricks, 2020). Therefore, it is believed that the furniture with proper ergonomics will promote physical comfort for children.

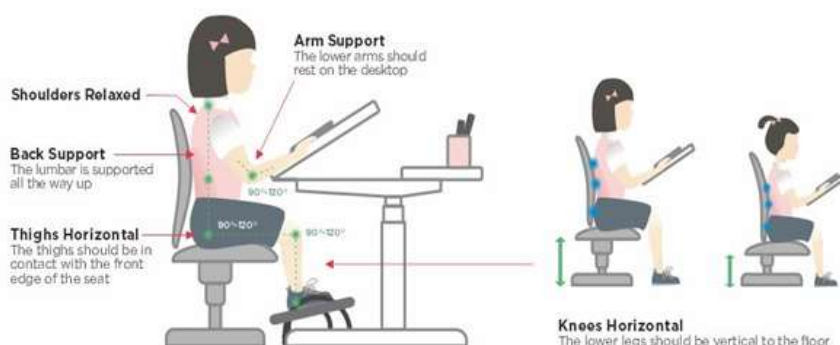


Figure 1 - Ergonomics for children

## 2.2 SUSTAINABILITY

Sustainable furniture is made from materials that have as little of an adverse effect on the environment as possible. Natural resources like wood are frequently used to make furniture, and widespread production of this product has adverse impacts on deforestation and greenhouse gas emissions. Sustainable furniture uses eco-friendly materials, such as bamboo, reclaimed wood, and recycled materials, which reduces the need to source new resources. They do not contain hazardous elements like volatile organic compounds (VOCs). Given that furniture is an investment that should be maintained over time, it is even more crucial to consider sustainable furniture pieces that are produced ethically and responsibly (Parker, 2024).



Figure 2 - Award winning sustainable designed preschool in California

## 3. Research Methodology

This research was done using the research onion method. Saunders' (2007) research onion, in its most basic form, outlines the various choices that will have to make when creating a research methodology by using its six layers, whether for the thesis, dissertation, or any other official research endeavor (Phair, 2021).

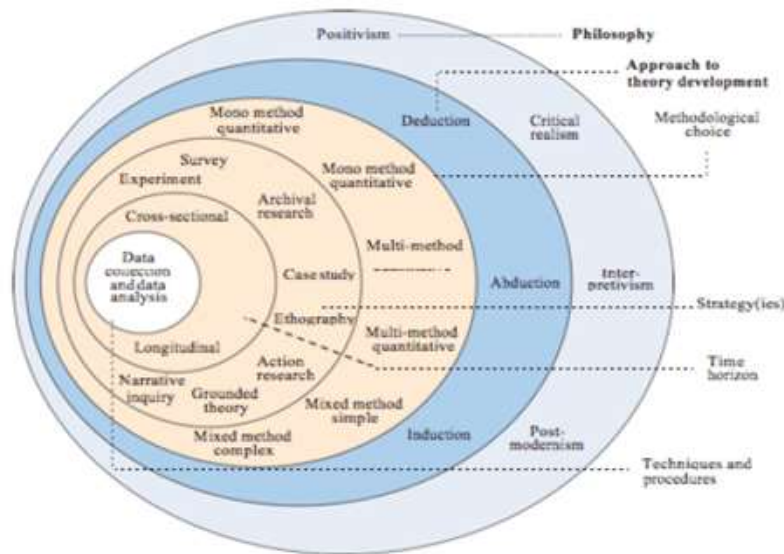


Figure 3 - Research Onion model (Melnikova, 2018)

The very first layer of the research onion is the philosophy layer. Philosophy is based on beliefs and assumptions. It is the belief in which research should be conducted, data should be collected, and data should then be analyzed (Children, 2022). In the philosophy stage, there are two extremes known as Objectivism and Subjectivism. This research falls under the subjectivism category because this was based on social factors as well as on opinions and assumptions and was conducted attached to the research. This category was mainly chosen because all aspects of research, including topic selection, hypothesis development, methodology selection, and data interpretation was decided by myself.

This research was done using the deductive approach, which means there was a relationship between the two-variable assigned in this research (Streefkerk, 2023), such as the relationship between the ergonomics of furniture and the comfort of children, the relationship between the materials of furniture and the comfort of children, the relationship between the sustainability of furniture and the comfort of children. This will have to go through a process of data collection, rejection, or confirmation of facts and analyzing them. Therefore, here there's are hypotheses that were developed based on existing theories and data, and then a strategy was designed to test the hypothesis.

The next stage was clarifying the methodological choice. The research problem and the general objective of the research may influence the choice of methods within the research; hence, at this stage, mono, mixed, or multi-methods are used to carry out certain study tasks (Warren, 2021). In this research, there was both quantitative and qualitative data. Therefore, this was done using a mixed method simple. To address your research issue, mixed methods of research incorporate aspects of both qualitative and quantitative research. Because mixed approaches include the advantages of both quantitative and qualitative research, they can provide a more comprehensive picture than either one alone. Therefore, this research was done using many methods that support qualitative and quantitative data.

Next layer of the research onion describes how research can be carried out depending on the study's objectives and it is known as the research strategy (Phair, 2021). Research strategies refer to collecting and analyzing data in different ways which suit the research and are practical for the researcher. The choice of strategy may differ according to philosophies (Streefkerk, 2023). Since this is conducted through a mixed method, this research has surveys and case studies.

When the time horizon is considered, the research was based on a cross-sectional studies method as there will be no continuation of this research in the future.

Next was the last stage of the research onion, which was the data collection and analysis method. Methods for data collection for the research were several methods such as; structured questionnaires and observations. Both methods were used to increase the reliability of the study. Questionnaires were given to the 72 parents who have preschool children between 2-5 years old to be answered on behalf of the children. The parents were selected using a snowball sample selection method on a day of a parents meeting. Here data such as ergonomics, materials and sustainable furniture designs were analyzed. The questionnaire was divided into four main parts: general section, ergonomics, materials and sustainable designs. These questions were given on a Likert scale to be answered. The survey or the questionnaire was done to gather data from participants about their children's attitudes, experiences, or opinions about preschool furniture.

Both the survey and the case studies are analyzed using descriptive analysis. This is a type of data research that helps describe, illustrate, or usefully summarize data points so that patterns can emerge that meet all the data's requirements. It is the process of using both present and historical data to find trends and connections. When considering ergonomics, physical ergonomics are considered here. There are three types of ergonomics known as physical, emotional and organizational ergonomics. The goal of physical ergonomics is to prevent injuries by designing and assessing work environments that consider repetitive motions, manual errors, and postures (Light Guide, 2021). The process of planning and organizing facts and information to produce a minimal cognitive load is known as cognitive ergonomics (Light Guide, 2021). How children interact with and complete their given task is influenced by their perception, memory, reasoning, and motor reaction. Children experience less stress when their cognitive ergonomics are in place. To maximize safety and efficiency throughout the space, organizational ergonomics incorporates the knowledge acquired from both physical and cognitive ergonomics (Light Guide, 2021). This is how furniture is placed in a space. For example, spaces where group work are arranged in a specific manner than an area for individual studying. Physical health, learning potential, and motor development of children can all be significantly improved by good classroom ergonomics.



Figure 4 - Photos of Blooms Preschool



Figure 5 - Photos of Kidsdom Preschool

For the observations two preschools were chosen. These preschools were chosen because both have the same properties as, both are in Colombo, private preschools and both follow the AMI teaching system. Data such as furniture types and furniture requirements were analyzed through observation. Observations were made by going to preschool for five consecutive days to observe how children behave and how they respond to different types of furniture. Quantitative

assessment tools are used here. This is a tool that assesses the quantity of factors based on measurements such as the weight of furniture, heights of furniture, angles of furniture (Kotowski, 2023). When sustainability is considered, tools such as materiality assessment and measuring of carbon footprints are considered. Furniture that uses materials that have no adverse effect on the environment is referred to as sustainable furniture. Common uses for sustainable furniture include: materials that are recycled or derived from renewable resources. materials that contain few chemicals that are harmful to people and the environment. To save shipping costs, use locally produced goods or resources. Materials that are durable and do not have any intentional obsolescence (Sustainable, 2020).

#### 4. Results and Analysis

Table 1 - Statistics for Ergonomics

N	Valid	72	72	72
	Missing	0	0	0
Mean		1.51	1.35	1.83
Median		2.00	1.00	2.00
Std. Deviation		.503	.479	.375
Range		1	1	1
Minimum		1	1	1
Maximum		2	2	2

The above figure shows the descriptive statistics of the first variable, Ergonomics. This indicates that the mean for question 6 to be 1.51, question 7 to be 1.35 and question 8 to be as 1.83 which are the questions related to ergonomics in the questionnaire. Both questions 6 and 8 have a median of 2, while question 7 has a median of 1. All three questions have the same range and the maximum and minimum.

The data collected on the "ergonomics" variable indicates that children’s perceptions on the ergonomics of furniture in preschool vary significantly. The results emphasize the need for ergonomically designed furniture with improvements to create a more appealing and satisfying environment with great physical comfort for children. Addressing on ergonomics concerns can contribute to enhance the overall physical comfort of children and promote a positive impact on them. Therefore, this shows that there is a positive relation between ergonomics and physical comfort.

Table 2 - Statistics for Sustainable design

N	Valid	72	72
	Missing	0	0
Mean		1.47	1.35
Median		1.00	1.00
Std. Deviation		.503	.479
Range		1	1
Minimum		1	1
Maximum		2	2

The above figure shows the descriptive statistics of the second variable, sustainability. Table 2 indicates that the mean for question 1 to be 1.47 and question 2 to be 1.35. Both questions 1 and 2 have the same median, range and the maximum and minimum values.

The research findings underscore the importance of optimizing sustainable furniture products within a preschool. This improves the visual appeal of preschool too. Addressing concerns expressed by children who rated sustainable design poorly can result in notable improvements to their overall experience, fostering higher physical comfort. The data suggests that majority of participants perceive having sustainable design methods for preschool furniture. A significant number strongly agree on using sustainable design methods. Therefore, this suggests that there is a positive perception on sustainability and physical comfort of children.

#### 5. Conclusion and Recommendations

This research aimed to explore the role of preschool furniture in the physical comfort of children. A mixed method approach was used by incorporating quantitative and qualitative data through surveys and observations. The findings revealed that preschool furniture significantly influences overall physical comfort in preschools. Proper ergonomics, materials and sustainable design methods promote physical comfort of children. The research onion model provided a structured

framework for research approaches, methods, and data analysis. The findings emphasize the importance of utilizing preschool furniture to enhance the physical comfort of children which will ultimately create a positive learning environment, paving the way for a brighter future for future generations.

This study highlights the importance of preschool furniture on the growth of children. Key recommendations include maintaining suitable heights for the furniture, having furniture with proper child ergonomics, using child-friendly materials, having lightweight yet strong materials, using low VOC materials and incorporating sustainable design elements. These recommendations encourage collaboration in creating a nurturing environment for children, promoting their physical comfort.

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