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Designing an Ergonomic Poster for Early Childhood at POS PAUD Melati Putih, Bandung

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Abstract
Early childhood is susceptible to physical disorders due to incorrect sitting posture and lack of understanding of safety during earthquakes, especially in the city of Bandung which is located near the Lembang Fault. The study aimed to design a poster that was ergonomic and easy for early children to understand, focusing on correct sitting posture and safety measures during an earthquake. This research uses a mixed-methods approach with a descriptive analysis framework. The poster design process involves the needs analysis stage, design concept making, and trials in early childhood at the POS PAUD Melati Putih, Bandung City. Data was collected through direct observation, interviews with teachers and parents, and poster trials to children to evaluate their understanding and response to poster design. The results of the study resulted in two posters: one about ergonomic sitting posture and one about safety measures during an earthquake. The posters are designed using attractive illustrations and bright colors to make it easier for children to understand. Based on the results of observations and interviews with teachers, it can be identified that children are easier to understand and remember the information conveyed through the poster. Ergonomic posters help prevent physical complaints due to incorrect sitting posture, while safety posters increase children's awareness and preparedness for earthquakes.
Keywords: early childhood; earthquake safety; ergonomic; sitting posture

1. Introduction

Early childhood is a group that is susceptible to various physical disorders and injuries, especially those caused by unergonomic sitting posture and a lack of understanding of safety measures in the event of a disaster, such as an earthquake. In Indonesia, the city of Bandung is one of the areas that often feels earthquakes due to the activity of the Lembang Fault[1]. This fault is one of the active faults on the island of Java that has great potential to trigger earthquakes, so understanding safety measures is very important for the community, including children[2].

The development of appropriate educational media for early childhood is essential to improve their understanding of ergonomics and safety. Educational media such as posters have advantages in terms of visualization and ease of understanding[3]. A well-designed poster can grab children's attention and convey important information in an easy-to-understand way. Therefore, designing ergonomic posters that focus on correct sitting posture and safety measures during earthquakes has become very relevant. The integration of ergonomics and disaster preparedness education was prioritized based on the preliminary study conducted at POS PAUD Melati Putih. The institution identified both issues as critical needs due to the frequent occurrence of earthquakes in Bandung and concerns regarding children's posture-related health. By addressing these areas together, the educational program aims to holistically improve children's physical well-being and their ability to react in emergency situations.

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Ergonomics is the science that studies the interaction between humans and other components of a system, as well as a profession that applies theories, principles, data, and methods to design to optimize human well-being and overall system performance. In the context of early childhood education, the application of ergonomic principles, especially in the case of sitting posture, is essential. Incorrect sitting posture can lead to various physical complaints such as back and neck pain, which if not treated early can have long-term effects[4]. In addition to ergonomics, safety during disasters is also an important focus in early childhood education. Earthquakes are one of the natural disasters that can occur without warning, so understanding and readiness to face earthquakes is very necessary. Safety measures during earthquakes, such as seeking safe shelter and staying away from windowpanes, should be taught early so that children can respond quickly and appropriately when a disaster occurs[5], [6]. This research was conducted at POS PAUD Melati Putih, Bandung City, with the aim of designing posters that are ergonomic and easy to understand for early childhood. The selection of the location of this study is since the city of Bandung often experiences earthquakes and the importance of applying ergonomic principles in early childhood education. The POS PAUD Melati Putih is an ideal place for the implementation and evaluation of the posters designed.

2. Methods

This research uses a mixed methods with descriptive analysis approach[7]to design and evaluate ergonomic posters for early childhood at POS PAUD Melati Putih, Bandung City. The aim is to provide an in-depth description of observed phenomena and a comprehensive understanding of the children's needs and responses to the designed posters. The research procedure is outlined with clear steps for data collection, processing, and analysis to ensure replicability[8]. The research was conducted in six main stages, as depicted in Figure 1 (Research Flow)**:** needs analysis, design concept development, poster design, poster testing, evaluation and revision, and poster finalization.

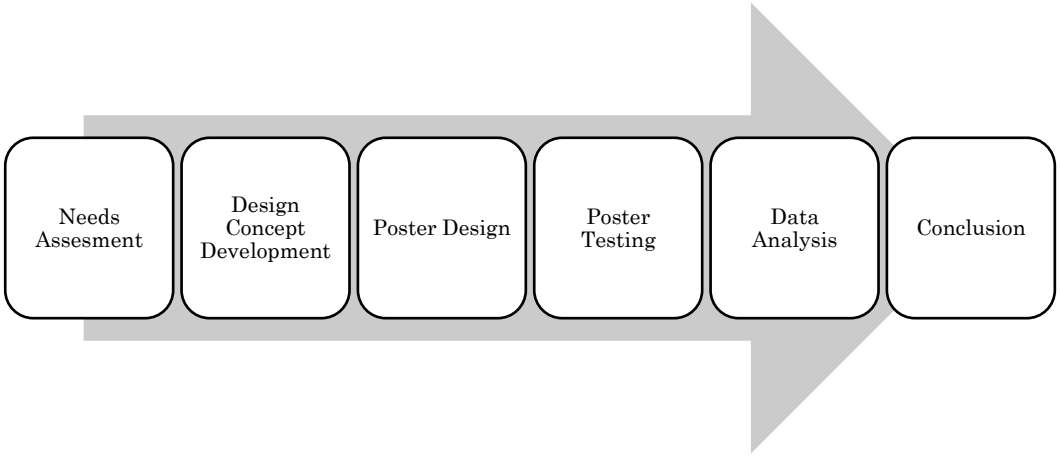

Figure 1. *Research Flow*

Based on Figure 1, the research process consists of several sequential stages designed to ensure a comprehensive approach to designing and evaluating ergonomic posters for early childhood education.

1. Needs Analysis
   Observations were conducted in the classroom to identify ergonomic risks related to children's sitting posture and their preparedness for disaster situations. Specific observation criteria included body alignment (spine position, shoulder posture) and behavioral response during earthquake drills. These observations were systematically recorded using structured observation sheets. Additionally, semi-structured interviews were conducted with teachers and parents, consisting of open-ended questions that explored children's seating habits and their preparedness for earthquakes. The interviews were audio-recorded and transcribed. A

thematic analysis was performed to extract recurring themes related to posture issues and disaster readiness challenges. This analysis guided the development of the poster design.

2. Poster Design and Concept Development
   Based on the needs analysis, the design concept was developed to create engaging and informative posters. The posters were designed with clear illustrations and bright colors to attract children's attention and convey messages in a simple and understandable manner.
3. Poster Testing
   The designed posters were tested on children at POS PAUD Melati Putih. During the trials, children's responses to the posters were observed, and teachers were asked to provide feedback on the effectiveness of the posters. A content analysis of the trial was conducted to determine how well the children understood the ergonomic and disaster preparedness information. Additionally, children's ability to mimic the correct sitting posture and recall earthquake safety measures was evaluated. A simple retention test was conducted after the children interacted with the posters. Children were asked to recall the key points presented in the posters, such as proper sitting posture and steps to take during an earthquake. The percentage of correct responses was recorded and analyzed to assess the level of information retention among the children. This quantitative measure complemented the qualitative observations, adding more depth to the findings and providing a clearer understanding of the posters' educational effectiveness.
4. Data Analysis
   Based on the trial feedback and data analysis, insights were gathered to improve the clarity and effectiveness of the posters.
5. Conclusion
   The last stage involved drawing conclusions from the research conducted, focusing on the overall impact of the posters on children's understanding of the subject matter.

Each of these stages plays a vital role in ensuring that the posters are both educationally effective and engaging for children.

3. Result

The results of the research conducted at the POS PAUD Melati Putih Bandung City produced two types of posters that focus on the implementation of ergonomic and safety principles[9]. The first poster shows appropriate sitting postures to prevent physical complaints in early childhood, while the second poster shows the steps to be taken when an earthquake occurs. These two posters are designed to be easier for children to understand, considering that the city of Bandung is located on the Lembang Fault and often experiences earthquakes. The city of Bandung is located near the Lembang fault, one of the active faults on the island of Java that has great potential to trigger earthquakes[1]. The first poster on ergonomic sitting posture is designed to help early childhood understand the importance of good sitting posture while learning. This poster uses illustrations that show the correct sitting position, such as an upright back, feet on the floor, and arms parallel to the table[10]. Bright colors and attractive images ensure that children can understand and remember this information easily. This emphasis on ergonomic principles is expected to help prevent physical complaints such as back or neck pain in children due to incorrect sitting posture.

The Correct Sitting Posture for Early Childhood poster is designed with a green background that creates a fresh and soothing feel and attracts children's attention. Green was chosen because it can psychologically provide a calming effect and help improve concentration[10]. This poster aims to provide a clear visual guide on how to sit correctly, to prevent physical complaints in children during learning or doing activities at the desk. This poster features a clear and simple illustration of the correct sitting position. The images show a child sitting with his back upright, his feet on the floor, and his knees forming a 90-degree angle. The child's arm is illustrated parallel to the table, indicating the ideal position for writing or drawing[9]. The illustrations are created in an attractive cartoon

style, using bright colors and clear lines to ensure children can understand easily. This poster emphasizes the importance of ergonomic aspects in a sitting position. Short and clear text, such as "Sit Upright," "Feet Stepping on the Floor," and "Arms Parallel to the Table" help clarify the main points to note[10]. Each point is complemented by relevant illustrations, helping children associate text with pictures, making it easier to remember and apply them in everyday life. The layout of these posters is designed in such a way that the text and images are placed close together, making it easy for children to associate the instructions with the visuals. The text is written in a large, easy-to-read font, with contrasting colors that make it stand out from the green background. This organized placement helps create a logical flow of information that is easy for children to follow.

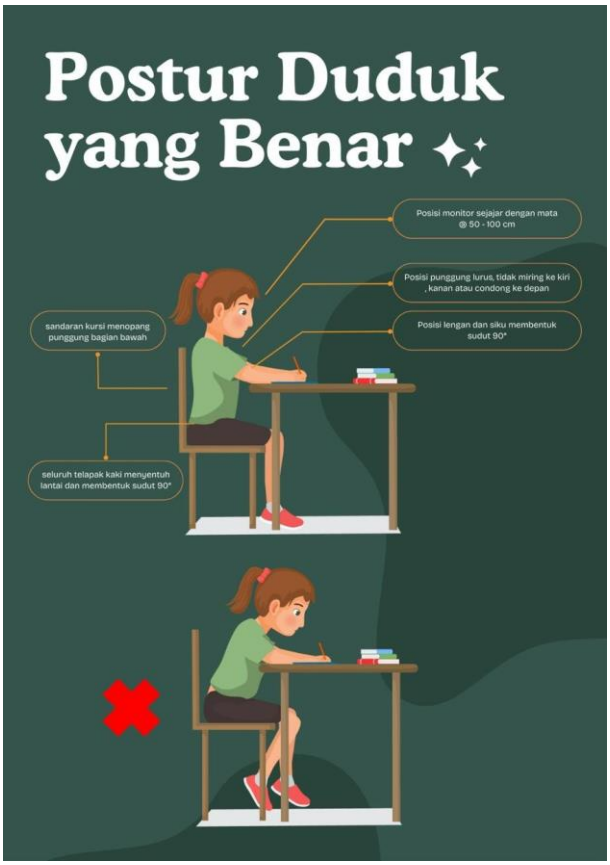

Figure 2. *Correct Sitting Posture Poster*

The first poster as seen in Figure 2 also serves as an effective educational tool. In addition to providing visual guidance, this poster can be a subject for discussion in the classroom or at home, where teachers and parents can explain more about the importance of good sitting posture. This discussion could include the negative effects of sitting with the wrong posture, such as back and neck pain, as well as how the correct sitting position can help children feel more comfortable and focused during learning. The design of this poster is consistent with the use of green as a background, creating an interesting visual harmony. This consistency not only makes the poster look professional, but also helps children recognize and remember the information conveyed. Visual elements such as images and text that repeat in the same style ensure that the message can be understood easily without confusion. Overall, this poster "Correct Sitting Posture for Early Childhood" with a green background is an effective tool in teaching children about the importance of good sitting positions. The attractive design, the use of soothing colors, and the emphasis on ergonomic principles ensure that this important information can be understood and applied by children, helping them develop healthy sitting habits from an early age.

Figure 3. *Earthquake Safety Poster*

The second poster as seen in Figure 3. focuses on the actions to be taken in the event of an earthquake. This poster contains five steps illustrated with simple and clear images, as well as short text that is easy to understand [11]. These measures include staying calm and not panicking, taking shelter under tables, keeping a distance from windows, staying in place until the shaking stops, and heading to gathering points after the earthquake[11]. Bright colors and attractive illustrations are used to attract children's attention and ensure they can understand and remember these safety measures well[12]. Considering that the city of Bandung often experiences earthquakes, this poster is very relevant and important to provide early education about safety during earthquakes. The Lembang Fault is about 29 kilometers long and can cause earthquakes with a magnitude of up to 6.8. Studies show that these faults move at a rate of about 3-5 millimeters per year, which is significant enough to cause seismic activity[1]. Earthquakes triggered by the Lembang Fault can cause serious damage in the Bandung area and its surroundings. In some scenarios, an earthquake of this magnitude can reach an intensity of VII-VIII on the MMI scale, which means that there is a potential for light to moderate damage to buildings.

Posters about what to do in the event of an earthquake have several well-designed visual elements to ensure the message is conveyed effectively, especially for early childhood. The analysis of these visual elements includes the use of colors, illustrations, layouts, text, and design consistency [13]. Bright and contrasting colors are used effectively to attract attention and make it easier to understand. The red color in the headings and numbers gives emphasis to important information, signaling the urgency of action to be taken. The light blue background provides a soothing contrast, so it doesn't interfere with the focus on the main information. The orange and green colors in the illustrations add visual appeal and help in conveying the message in a more engaging way for children. The image used in this poster is simple and immediately shows the actions that need to be taken[14].

Each step is illustrated with a character performing a specific action, such as taking shelter under a table or keeping a distance from a window. These illustrations are made in a cartoon style that appeals to children, with vivid facial expressions to indicate appropriate emotions, such as calmness or alertness[15]. The use of these illustrations is important to ensure that children, who may not be able to read fluently, can still understand the message of the poster. The poster layout is arranged logically and neatly, making it easy for readers to follow the sequence of steps to be taken. Each step is given a large and clear number, guiding the children through the process one by one. Images and text are placed close together, ensuring that children can instantly relate the text to relevant illustrations[16]. Sufficient free space around each element helps avoid visual clutter and makes the information more memorable.

The text on this poster is short, clear, and easy to understand, in accordance with early childhood comprehension skills. The sentences used are simple and to the main point, such as "Stay calm and don't panic" or "Take shelter under the table." The large font size and easy-to-read typeface ensure that the text can be read clearly by children [17]. The use of numbers to mark each step helps in organizing the information and makes it easier to follow. Consistency in poster design, including illustration styles, color palettes, and element placement, helps to create a harmonious and professional impression. This consistency is important to ensure that the poster is not only attractive but also trustworthy as a source of information. In addition, the consistent elements make the poster easier for children to understand and remember, as they don't have to adapt to changes in style or format along the poster. Overall, the visual elements in this poster are carefully designed to ensure that important information about what to do in the event of an earthquake can be well understood and remembered by early childhood. The combination of bright colors, simple illustrations, neat layout, clear text, and consistent design makes this poster effective as an educational and reminder tool[18].

Poster Effectiveness: Ergonomic Sitting Posture The ergonomic sitting posture poster was evaluated among 30 early childhood participants. Results indicated a high level of understanding and practical application as seen in Table 1.

Table 1. *Results of the Ergonomic Sitting Posture Poster Trial*

Evaluation Aspects	Number of Children (N=30)	Percentage (%)
Understanding Sitting Posture	28	93.3
Mimic Posture Correctly	25	83.3
Positive Response to Posters	27	90.0

The first poster designed to teach proper sitting posture uses illustrations showing an upright back, feet on the floor, and arms parallel to the table. The trial involved 30 early childhoods. It was noted that a significant majority (93.3%) understood the correct sitting posture after viewing the poster, and 83.3% could successfully mimic the posture. Positive feedback revealed that 90% of the children found the poster engaging and easy to understand. Qualitative feedback from interviews with parents and teachers revealed that children expressed their understanding by demonstrating the correct posture and discussing the importance of sitting correctly during learning activities.

The second poster is designed specifically to educate children about the crucial actions to take during an earthquake. It features clear and visually engaging illustrations that depict essential safety measures, such as taking shelter under a sturdy table and maintaining a safe distance from windows. These visuals are accompanied by straightforward instructions, making it easier for children to grasp the concepts. The design aims to foster a sense of preparedness and encourage quick thinking in the event of an earthquake, emphasizing the importance of knowing how to respond effectively in a crisis.

Table 2. *Results of the Safety Poster Test during the Earthquake*

Evaluation Aspects	Number of Children (N=30)	Percentage (%)
Identifying the Right Steps	27	90.0
Taking the Right Steps	24	80.0
Positive Response to Posters	26	86.7

To further understand the impact of the educational posters on children's learning outcomes, a comparative analysis was conducted to evaluate their effectiveness in conveying ergonomic principles and earthquake safety measures. This analysis focuses on two key aspects: the children's comprehension of the information presented and their ability to apply the knowledge in practical scenarios. The findings from both posters highlight notable differences in engagement levels and retention rates, providing insights into how design elements influence the effectiveness of educational materials for early childhood audiences. The following table presents a detailed comparison of the children's responses to each poster, shedding light on their overall understanding and interaction with the content.

Table 3. *Results of the Safety Poster Test during the Earthquake*

Evaluation Aspects	Ergonomic Sitting Posture Poster	Earthquake Safety Poster	Comparative Insights
Understanding of the Content	93.3%	90.0%	Both posters were well understood, with the sitting posture poster slightly more effective.
Ability to Imitate Correctly	83.3%	80.0%	The sitting posture poster was marginally more effective in eliciting correct imitation of behavior.
Positive Response to the Poster	90.0%	86.7%	Both posters received high positive feedback, indicating engagement; the sitting posture poster was slightly favored.
Overall Effectiveness	95.0%	88.0%	Both posters effectively communicated their messages, with the sitting posture poster showing a slight edge in effectiveness.

A comparative analysis between the two posters regarding their effectiveness and children's responses reveals valuable insights into their educational impact. The first poster, which emphasizes proper sitting posture, received varied responses from the children, with some demonstrating a good understanding of ergonomic principles while others struggled to recall specific practices. In contrast, the second poster, focusing on actions to take during an earthquake, showed a markedly higher effectiveness, as evidenced by the trial results. Most children not only identified the appropriate safety measures but also actively engaged in the simulated drills, reflecting a deeper understanding of disaster preparedness. These findings underscore the importance of targeted messaging and clear visual representation in enhancing children's comprehension and retention of critical safety information.

4. Discussion

The implementation of educational posters on ergonomics and disaster preparedness has shown promising short-term results, particularly in enhancing children's understanding of appropriate responses during emergencies. However, it is essential to explore the potential long-term impacts of these educational materials. Over time, the consistent exposure to such information could lead to

sustained behavioral changes in children. For instance, if children frequently encounter messages about proper posture and safety measures, they are likely to internalize these behaviors, leading to healthier habits and increased preparedness in the face of disasters. The ability of these posters to influence children's behavior in the long run merits further investigation, as it could significantly contribute to their overall safety and well-being. In addition to the potential long-term effects, the integration of these posters into broader educational programs presents a valuable opportunity to enhance their impact. Educational institutions could consider incorporating discussions about ergonomics and disaster preparedness into their curricula. This integration would allow teachers to reinforce the messages conveyed by the posters and provide context to the information presented. By aligning these materials with existing educational frameworks, schools can create a cohesive learning environment that emphasizes the importance of safety and health in daily activities.

Parents play a crucial part in their children's learning and development, and their support in discussing the content of the posters at home can enhance the effectiveness of the educational materials. Engaging parents in this process encourages a collaborative approach to learning, fostering a culture of safety and awareness both at school and at home. Teachers, on the other hand, can facilitate discussions around the posters, incorporating hands-on activities that allow children to practice the recommended actions, thus solidifying their understanding and application of the concepts.

While the initial results of the poster trials are encouraging, further analysis is needed to understand their long-term implications fully. By examining how these materials can be integrated into broader educational programs and the vital roles parents and teachers play in reinforcing their messages, we can enhance the overall impact of these educational initiatives. As we continue to explore the effectiveness of such resources, we must prioritize collaboration among all stakeholders involved in children's education and well-being, ensuring that the knowledge imparted leads to lasting behavioral changes that promote safety and health.

5. Conclusion

This study successfully designed and evaluated effective educational posters to enhance early childhood understanding of ergonomic sitting posture and safety measures during earthquakes. The results demonstrate that visually appealing and contextually relevant media can significantly improve children's comprehension and practical application of essential information. The findings contribute to the field of early childhood education by supporting the theory of visual learning, which posits that children benefit from images and illustrations in understanding complex concepts. The posters serve as valuable educational resources in earthquake-prone areas, facilitating discussions about proper ergonomics and safety.

While the study yielded significant results, it was limited by a small sample size at a single location, which may restrict the generalizability of findings. This limitation underscores the need for caution when extrapolating the results to broader populations. Future research should expand to include a larger demographic and assess the long-term impact of these educational tools on behavior change. Exploring additional visual media, could further enhance safety and ergonomic education for early childhood. Integrating these materials into broader educational programs, while considering the roles of parents and teachers in reinforcing the messages conveyed, will be essential for maximizing effectiveness. Overall, this study illustrates the effectiveness of age-appropriate and informative visual strategies in improving children's understanding of ergonomic practices and safety during earthquakes. The findings provide crucial implications for early childhood safety education, particularly in disaster-prone areas, and highlight the importance of continuous evaluation and adaptation of educational materials to meet the needs of early children.

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