

## **Fundamental movement skills and sensory movement strategies to support online learning in early childhood**

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### **Abstract:**

The ongoing COVID-19 pandemic has presented a challenge for parents when helping children to find solutions to problems faced primarily in the learning process and to aid children with being involved in online learning. In some children at an early age, the online learning process becomes tougher because children will experience obstacles, such as difficulty maintaining concentration and being easily distracted; thus, they will not be actively involved in the learning process. The purpose of this study was on actions during the online teaching–learning process in an early childhood class. In this research, the case involved a bounded context and consisted of a preschool group of younger children between 1 and 3 years of age and their preschool teachers. The focus during the observation was on the child–adult interactions during different activities and different times of the day during the online teaching–learning process. The aim was to identify if and to which extent preschool teachers had similar ways of engaging in activities during their interactions with children online using the Zoom platform, especially regarding movement learning. This research was designed as a case study using a qualitative approach. Children who are of early age in their daily life need the ability to move in a systematic and controlled way, such as running, jumping, playing with objects, and self-control. Learning movement with fundamental movements and sensory movements are alternatives for providing children with a sensory experience and a solution to movement learning. These activities are integrated into learning processes in early childhood. Thus, fundamental exercises of skill and sensory movement online in terms of learning participation and independent experiences in children’s early learning classes are crucial to optimize the children’s growth and development, especially in the physical aspect of their early childhood motor development.

**Keywords: fundamental movement skill, sensory movement, online learning, early childhood**

### **Introduction**

The COVID-19 pandemic that has been taking occurring March 2020 presents challenges for parents who have young children regarding adapting to learning using online methods. In addition, not all parents have basic pedagogical skills that support the independent learning process for children. This requires alternatives or new strategies to support childhood online learning. Particularly for movement learning, learning is the optimization of physical development, which involves children's physical components, such as muscles, joints, and bones. One way to stimulate early childhood physical development is through Fundamental Movement Skills (FMSs). FMSs are physical activities used as a means of developing various basic movement patterns that can support children's life skills. Children who have good movement skills are believed to have higher self-esteem and self-confidence (Dobell, Pringle, Faghy, & Roscoe, 2020). FMSs involve different body parts, such as the legs, hands, body and head, when carrying out the movements. FMSs also include physical skills, such as running, jumping, catching, throwing, hitting targets and balance (Duncan, Roscoe, Faghy, Tallis, & Eyre, 2019). These movements are basic movements or preliminary patterns for more specific skills, and there are more complex movements in the later stages of development and will be used by children in their playing time, sport, dance, gymnastics, outdoor education, and physical recreational activities (Barnett, Stodden, & Cohen, 2019). FMSs are placed into three categories, namely body management, locomotor skill and object control. According to the systematics, FMSs involve body management skills, locomotor skills, and object control skills. Children who have better FMSs will find it easier to participate in various physical activities in the next developmental stage (Hu, Jiang, Ji, Pang, & Liu, 2020). Education about FMSs for parents is important to optimize the growth and development of children, especially with regard to their physical development and pre-screening for understanding sensory difficulties in early childhood (Duff, Issartel, O’Brien, Belton, 2019). Early information on the difficulty of sensory integration helps educators recognize and analyse various obstacles or sensory processing disorders in several senses, including auditory, visual, tactile, proprioception, vestibular and interoception (Akbar & Awalludin, 2020).

Sensory integration is the process of recognizing, changing and differentiating sensations from the sensory system to produce a response in the form of adaptive behaviour. According to Awalludin & Akbar

(2020), sensory integration is the process of organizing or interconnecting sensory systems to function correctly so the brain can accurately interpret information. Sensory integration theory was initially described as a concept that requires a lot of imagination about unexpected phenomena. Sensory integration is how our brains receive and process sensory information so that we can do the things we need to do in everyday life. Sensory integration is defined as a neurological process that regulates sensations from the body and from the environment, enabling the effective use of the body in adapting to the environment (Klingberg, Schranz, Barnett, Booth, & Ferrar 2019). Most people experience development of sensory integration in their childhood. This development starts from various activities that we do in childhood, such as rolling over, crawling, walking, and playing (Jones, Innerd, Giles, Azevedo, 2020). This indicates that sensory integration is correlated with the solution to children's movement problems. One effort was to develop a way to assess children's movement difficulties by understanding sensory integration in children (Roscoe, James, Duncan, 2019). Sensory integration difficulties are known as sensory processing disorders in multiple senses. In this case, sensory integration is related to 5 senses, namely the senses of seeing, hearing, feeling, smelling, and touching and 3 other issues, namely proprioception, vestibular issue and interoception senses (Webster, Martin, Staiano, 2019; Robinson, 2020).

To the best of our knowledge, none of them has examined further explanations activities of fundamental movement skills and sensory strategies with online methods during the COVID-19 pandemic. Therefore, in this paper, we describe basic fundamental movement skills and sensory integration strategies for supporting movement learning through online methods during the COVID-19 pandemic. Without such investigation, it is not possible to assess the implementation and effectiveness of fundamental movement skills and sensory strategies through online. This study aimed to identify if and to which extent preschool teachers had similar ways of engaging in activities during their interactions with children online using the Zoom platform, especially regarding movement learning. This is expected to provide some insights, such as helping educators and parents to carry out learning using online methods, and the movement learning process carried out can become one of the elements used for providing alternative solutions to various obstacles to online learning that are experienced by children. Additionally, basic fundamental movement and sensory movement are alternatives for providing sensory experiences and solutions to the movement problems of children during this time.

**Materials & methods**

This study was designed as a case study. In a case study, researchers attempt to understand and interpret a unit in terms of its actors. A case study provides a unique example of actors in real situations and investigates the interactions of those involved. The strength of a case study is that it allows attention to actions taken for granted (Alam, 2020). In this study, we focused on actions that could be done in the online teaching-learning process in early childhood classes (Amelia, Hendratno, Jannah, 2019). In this study, the case involved a bounded context and consisted of a preschool group of younger children between 1 and 3 years old and their preschool teachers who have been working (teaching) for several years. The preschool setting was located in an urban area in Jakarta, Indonesia. Data collection was done based on field notes, photos, and videos taken during the learning process. Field notes were carried out especially during the initial part of the study. The focus during observation was on child-adult interactions during different activities and different times of the day during the online teaching-learning process. The aim was to identify if and to what extent preschool teachers had similar ways of engaging in activities during their interactions with children online using the Zoom platform. Different situations that were observed during different days and with different preschool teachers were focused on. This enabled researchers to choose between a variety of activities and to perform a deep study of some of them.

**Results**

The focus of this study was distance learning that integrates basic movement patterns from FMS and sensory stimulation as an alternative to solve problems that have occurred in online learning during the pandemic. The application of learning related to FMS and sensory movement in kindergarten for early childhood was carried out via the following activities.

*Fan ball game with the theme of the elements of life (air)*

Air is an especially important component because we breathe the air. To introduce children to the idea that we can feel the air and it has strength, an activity was given to the children, which was a fan ball game. The equipment used included a fan and colourful plastic balls. The children were required to make a start and finish line with a distance of 5 steps; then, the children took several balls, for example, 10 balls, that would act as a fan. When fanning the balls, some children were on all fours, and some were standing and bending over their body and bending their knees a little. The relationships between the fan ball game with the theme of the elements of life (air) and FMS and sensory movement were as follows.

Table 1. Fan ball game with the theme of air in life, FMS and sensory movement

FMS Playing with a certain object, a fan. Every swing of the arm pivots the joint. Walking and crawling used to change places.	Sensory Movement Visual stimulation by seeing various colours of the balls. Vestibular stimulation occurred when the children walked while fanning the balls. The tactile sensor was stimulated when crawling and when holding the fan and ball. For sensory proprioception, stimulation occurred when the children moved from the start line to the finish line, stimulating their awareness of motion and space.
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Figure 1. An example of the fan ball game with the theme of air in life

*Rollet game with the theme of the elements of life (earth)*

Soil is an especially important part for human life. Soil is a basic element used for farming; thus, humans need to maintain and cultivate land (soil) as well as possible. It will ultimately affect the quality of human life. To introduce the idea that the soil is especially important as a place for activities and to develop children's physical components, the activities carried out by children were done on the ground, namely through a rollet game. The game was performed by the children by making cards numbered from 1 to 10 and then arranging the cards according to the sequence of numbers in a circle. The children played the game by counting numbers from 1 to 10 while having their feet touch the physical number (cards). The counting could be done in various ways, such as counting the odd and even numbers. In the final stage, the children calculated randomly positioned numbers (cards) in the right sequence. Then, the child would move quickly to find numbers according to the sequence.

The relationships between the rollet game with the theme of the elements of life (soil) with FMS and sensory movement were as follows.

Table 2. Rollet game with the theme of elements of life (soil), FMS, and sensory movement

FMS	Sensory Movement
In the rollet game, FMS motion was more focused on the locomotor movement of running, while stability was stimulated when the children were touching the numbers used one foot. The manipulative movement was stimulated when they arranged the numbers (cards).	Vestibular sensory movement involved the movement of counting numbers while touching a number (card) with one foot. Visual sensory movement occurred when the children looked for numbers. However, auditory occurred when the children counted the numbers aloud.



Figure 2. Example of the rollet game with the theme of elements of life (soil)

*Animal yoga pose with a forest theme*

The forests are the lungs of the world because they are the major source of oxygen. The result of tree photosynthesis is oxygen, and the compound absorbed by the tree is carbon dioxide. To aid in understanding protection of the forest, the children were introduced to forest preservation and the preservation of animals that live in the forest. Thus, the activity carried out was yoga to imitate animal movements. The children imitated yoga activities guided by the teacher through Zoom. The activities started with a warm-up. The animal movements, such as dog, elephant, tiger, bear, snake, butterfly, monkey, and giraffe poses, were imitated into yoga movements. The poses of the animals were repeated starting from one animal and moving to others.

The relationships between the forest theme animal yoga poses with FMS and sensory movement were as follows.

Table 3. Animal yoga poses with forest themes, FMS and sensory movement

FMS	Sensory Movement
The FMS movement in yoga is more focused on stability movement because these animal poses are all related to postural control with no motion (moving between places) and on the movement of playing objects. All yoga poses involve some sort of joint axis. The more joints involved, the more complicated it is to control posture. Moreover, the body's support area on the floor decreases. This is a challenge for children and requires more focus.	The sensory movements stimulated were vestibular, tactile, and auditory movements.



Figure 3. Example of the animal yoga pose with a forest theme

*Star game with a sky theme*

The little star song is a song commonly sung by children. Through this song, children imagine the things in the sky. At night, the children can look at the sky and find twinkling lights, namely the stars. Introducing symbolic forms is the first step of stimulating cognitive and language aspects. This is the initial stage to introduce the process of reading and calculating. That is why the star game is introduced to children.

The game starts from making a star symbol made of raffia cord, as shown. Of course, the children were assisted by a companion at home. After making a star, then the children prepared numbered cards. The cards used were numbered from 1 to 10. The children placed one random number card at each point where the star-forming lines met. Incidentally, the number of dots were 10. After placing them randomly, then, the children counted from number 1 to 10 by stepping on one number at a time starting from number 1 and continuing to 10. Then, the child was asked to discuss whether the movement was sequential or random. After finishing the discussion and finding the answer, the children were asked to think about how to make the path in a good sequence (not random). At the end of the activity, the children jumped from numbers 1 to 10.

The relationships between the sky-themed star game with FMS and sensory movement were as follows.

Table 4. Star game with a sky theme, FMS and sensory movement

FMS	Sensory Movement
The game is more dominant on running and jumping for FMS	The most dominant sensory movement is vestibular.

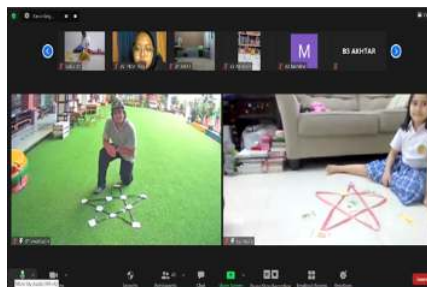


Figure 4. Example of the star game with a sky theme

*Game of colours and fish names with a sea theme*

The sea is the largest expanse on Earth. Most of the Indonesian state is next to the sea (ocean). Ancestors of the Indonesian people were also known as sailors. To introduce the sea to children, we teach that life and the ocean are inseparable. One of the marine animals is fish. Fish is a high source of protein and is rich in core minerals needed by our body. That is why children need to know the various kinds of fish in the sea and the kinds that we eat often. This fish and colour game was conducted to introduce various kinds of fish to the children.

First, the children wrote the name of the fish on colourful origami papers: one colour for one fish. The number of colours and fish could be between 4 and 6 kinds. After writing the name of the fish on the origami

papers, the children arranged the papers in a line. Afterwards, the children stood behind the papers while the teacher acted as the game leader. The teacher mentioned one colour of the paper, and then, the children responded by stepping on the paper according to the colour mentioned. Next, the teacher mentioned the colour, stepped on the colour, and told the fish's name and vice versa. The difficulty level can be increased by mentioning 2–3 colours at once.

The relationships between colours and fish names game with a sea theme with FMS and sensory movement were as follows.

Table 5. Game of colours and names of fish with a sea theme, FMS and sensory movement

FMS	Sensory Movement
The colour and fish name game for FMS was focused more on walking and stomping.	The most dominant sensory movements were visual and auditory.



Figure 5. Example of colour and fish name game with a sea theme

*Planet game with a sky theme*

Apart from the stars in the sky, the solar system is also in the sky, of which the Earth is one of the planets in the Milky Way galaxy system. Apart from the Earth, there are also other planets that have been explored, namely Mars. To introduce the distance between the planets, the planet game was given to the children. The tools used included materials available at home (loose part).

First, the children prepared 9 circle-shaped objects. These objects were used as the Sun, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. The objects were arranged in a row according to the order. The children wrote only the planets of Earth and Mars and the Sun themselves, while other planets were written by the companion. Afterwards, the children were asked to stand on planet Earth and then moved around the Sun by walking while counting how many steps were taken. The number of steps taken was written on a sheet of paper. Next, the children stood on another planet, moved around the sun and counted how many steps were taken. The children were required to do the same thing on other planets. At the end of the activity, the children were invited to discuss which planet was farthest and which planet was closest.

The relationships between our sky-themed planet game with FMS and sensory movement were as follows.

Table 6. Sky-themed planet game, FMS and sensory movement

FMS	Sensory Movement
In the planet game, the FMS was locomotor, namely, the walking in a circle activity. The manipulative movement occurred when the children put down the objects used for the game.	Sensory movement in this game was the proprioception sense that related to movement awareness because walking in a circle is related to awareness of space. When holding different objects, the tactile sense was stimulated.

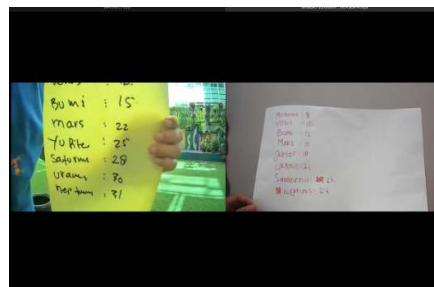


Figure 6. Example of the sky-themed planet game

*Javanese Chess Game with the “welcome great years” theme*

“Welcome great years” involves a series of activities to welcome the new academic year. The Javanese chess game was chosen because there are patterns formed by children and their opponents. There is a sense of joy in every victory, especially in the case when the winner is the child and the opponent is an older sibling, parent, or another adult. When starting a new school year, the Javanese chess game is highly suitable because joy is planted in the hearts of children when they win the competition.

In this Javanese chess game, children are required to think strategically. First, the children were asked to make a chessboard made of slats that forms 9 columns. The game was played by preparing 2 different coloured origami pieces (by the children). Each colour was in 5–6 pieces. Children needed to draw the winner. The winner got the first turn. The player was considered to win if one colour formed a row of 3 either vertically, horizontally or diagonally. The game was repeated for 5 rounds. The score results were written on the scoreboard. The relationships between the “Welcome great years” theme of the Javanese chess game with FMS and sensory movement were as follows.

Table 7. Javanese chess game with the theme of “Welcome great years”, FMS and sensory movement

FMS	Sensory Movement
Manipulative movement is the most dominant in the Javanese chess game, namely when placing colored paper. The stability movement in the chess game is when the children do a squatting movement.	Sensory movement in this game involved the proprioception sense that is related to movement awareness because walking in a circle is related to awareness of space. When holding different objects, the tactile sensory was stimulated.



Figure 7. Example of a Javanese chess game with the theme of “Welcome great years”

*Spray the ball game, natural phenomena (tsunami)*

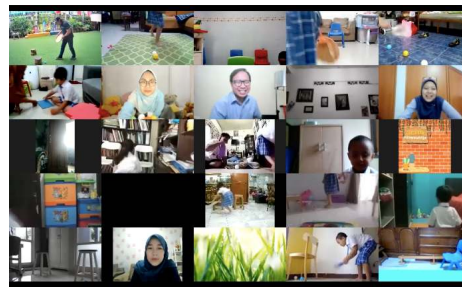
A natural phenomenon is a disaster or event that occurs naturally and is caused by changes on Earth. One of them is the tsunami. Indonesia is a region prone to earthquakes that may cause tsunami waves. To find out how great the strength of a tsunami is, which is caused by sea waves in which the water becomes the medium to sweep the land, children are introduced to the power of water through bird spray.

The children prepared colourful plastic balls and a water-filled spray bottle. The children were required to make the starting and finish lines with a distance of 5 steps for the children. The balls might include as many as 5–10 balls in a variety of colours. The children were required to spray the balls from the starting line to the finish line. The balls were sprayed one by one until the balls ran out. For the discussion of the material, the children were asked about the reason behind the balls’ motion so the children analysed the phenomenon of spraying the balls. The relationships between the natural phenomenon of the spray the ball game (tsunami) with FMS and sensory movement were as follows.

Table 8. Tsunami natural phenomenon with spray the ball game, FMS and sensory movement

FMS	Sensory Movement
The most dominant FMS movements included locomotor movements, namely walking, crawling, and/or squatting.	The sensory movement in this game was proprioception when the children pressed the spray to try to get water out of the sprayer because the proprioception sense can be stimulated by physical activities that involve many muscles and require more effort to do this activity. The visual sense was also stimulated upon seeing the colours of the balls used to play.

Figure 8. Example of the tsunami natural phenomenon using the spray the ball game



**Discussion**

Early childhood development is the basis of the learning process that will shape experiences and determine the development that children will carry their age life. As an initial foundation, early childhood is a determinant of a child's readiness and success in learning in future education (Lander, Eather, Morgan, Salmon, & Barnett, 2017). This is in line with the statement that the first years of a child's life is the most important

period and becomes the basis of child development. This is also reinforced by the statement that the early age phase is a phase in the process of human growth and development which influence the success of life as an individual and provide opportunities that important as the basis for lifelong learning (Dobell, Pringle, Faghy, & Roscoe, 2021). Success in this period will help children to grow and develop effectively optimal learning that will be the basis of children's learning throughout life.

The years of child's first pre-school period is a period in a child's development where Sensorimotor integration develops rapidly as the child interacts with the environment. A stage of development, where the child needs stimulation in explore by developing sensory-motor tasks as a way of learning about themselves and their environment (Bolger, Bolger, O'Neill, Coughlan, O'Brien, Lacey, et al., 2021). Sensory is a child's means recognize and understand the world and the environment around children. Sensory processing is the process of receiving sensations that arise in the immediate environment and then being organized, processed then interpreted these sensations into the central nervous system to produce reactions appropriate (Xin, Chen, Clark, Hong, Liu, & Cai, 2020). This process is the basic process of the brain that feels every input sensation from the body and the surrounding environment which is then processed and displayed in the form of appropriate behavior (Van Capelle, Broderick, van Doorn, Ward, & Parmenter, 2017). Every sensation information that is around the child It is expected that the child will enter and be accepted and respond appropriately through the child's behavior appropriate. This process will affect the child's readiness and ability to learning and the active role of children in daily activities (Duncan, Roscoe, Noon, Clark, O'Brien, & Eyre, 2020). So that when the child has entering the world of preschool, all children should be able to carry out their daily activities while exploring and interacting within their environment with ease.

The provision of fundamental movement skills and sensory stimulation should be given through a play approach, remembering the world of children is play and through play children learn (Rudd, Barnett, Farrow, Berry, Borkoles, & Polman, 2017; Utesch, Bardid, Büsch, & Strauss, 2019). Play is an activity involving basic sensory, motor, cognitive, social communication, and physical interactions and children's social environment (Engel, Broderick, van Doorn, Hardy, & Parmenter, 2018). Play activities is part of the world of children who can develop their potential and abilities the basis of the child in the period of growth and development (Ma, Lander, Eyre, Barnett, Essiet, & Duncan, 2021).

### Conclusions

Online learning is not face-to-face learning but is carried out through an appropriate learning platform or application. The process of movement learning in online learning can be supported through basic movements, such as running, jumping, walking, throwing, and balance movements. In the process of movement learning, sensory integration is involved to solve sensory difficulties in early childhood. Therefore, in the learning process, it is necessary to take advantage of several forms of sensory integration, namely, auditory, visual, vestibular, and tactile system and proprioception. Basic movement exercises in fundamental movement skills and sensory skills can optimize the child's growth and development, especially in the aspects of physical movement of early childhood to aid with movement difficulties of children when studying online.

**Conflicts of interest** - The authors have no conflicts of interest to declare. All co-authors have seen and agree with the contents of this manuscript, and there is no financial interest to report. We certify that the submission is an original work and is not under review at any other publication.

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