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## Piaget's Sensorimotor Stage: Activities to Enhance the Cognitive Development of Infants and Toddlers

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## Piaget's Sensorimotor Stage: Activities to Enhance the Cognitive Development of Infants and Toddlers

### Abstract

Sensory play is an effective way to encourage experimentation, even with children as young as infants and toddlers. Early childhood is the developmentally appropriate age for acquiring sensory awareness. One of the leading theorists on infant cognitive development is Jean Piaget. He referred to the first two years of life as the sensorimotor stage because at that age infants are primarily involved in explorations involving their movements and senses. Early childhood educators should analyze Piaget's work when designing a stimulating environment containing sensory-rich materials to enhance cognitive development consistent with developmental stages. This article addresses the six sub-stages of sensorimotor development and a variety of activities to help enhance the cognitive development of . infants and toddlers. It will also focus on guidelines for setting up a sensory play program with the emphasis on equipment and materials, and the role of the teacher.

Piaget's Sensorimotor Stage:  
Activities to Enhance the  
Cognitive Development of Infants and Toddlers

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By  
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With the growing number of infant/toddler curriculum guides and texts, knowledge and interest concerning sensory play for infants and toddlers is increasing. We now know that infants and toddlers are competent learners. A child's early experiences are an important foundation for learning in later years. Infant/toddler care should be more than custodial care, for it should take into account each child's individual development.

Educating the child must be of primary concern. If you are to educate, you must have a plan for teaching and learning. Quality, loving care in a safe environment with individualized, child-directed learning is needed. Understanding how to use each child's natural interests, curiosity, and motivation will facilitate the learning process.

#### Importance of sensory play

A major component of any infant/toddler program is play. Early childhood educators have long recognized play as vital to growth and learning. Play is natural to young children and should be regarded as an important use of their time, not as supplemental or optional. Through play, children become involved in open-ended exploration. They are not confined by rules, procedures, or outcomes. Children also learn from other children. By interacting with their peers, infants and toddlers learn much about their world, their power in it, and their influence on others (Gonzalez-Mena, 2001). Children at play have self-direction; in their play they make discoveries they might otherwise have never made. It seems that solving mysteries, making choices, exploring, and discovering are what interests children most.

Sensory play is a good way to encourage experimentation, even with children as young as infants and toddlers. The early forms of positive sensory stimulation are extremely important. Infants have developed a surprisingly large number of ways to explore objects through their senses: looking, tasting, touching, hearing, and smelling. The more attractive and pleasant sensations the infant receives, the more he or she will respond to caregivers and the environment, therefore, enhancing cognitive development.

Early childhood is the developmentally appropriate age for acquiring sensory awareness, which is critical for the improvement of imagery in memory development and the reproduction of sensations (Fineman, 1962). Recommendations made by the National Association for the Education of Young Children (1997) have emphasized the importance of developmentally appropriate environmental experiences. These experiences should

encourage children to speculate and explore the world with their senses. According to Csikszentimihalyi (1993), "...inside each person there is a wonderful capacity to reflect on information that the various sense organs register, and to direct and control these experiences" (p. 22).

Piaget's theory on cognitive development as it relates to sensory play

In cognitive theory, behavior is considered to be a form of intelligence because most of what people do is goal-directed and depends on their knowing what to do under particular circumstances (Fogel, 2001). One of the leading theorists on infant cognitive development is Jean Piaget. Piaget's contribution to cognitive development was to conceptualize human intelligence as a form of adaptation to the environment. In his view, even small infants can act in intelligent ways, not only by thinking, but by acting physically on the environment in order to meet their goals (Piaget, 1952).

Piaget's (1969) main goal was to apply his theory to the development of human intelligence, for he stated that the origin of intelligence is found in human infancy. He referred to the first two years of life as the sensorimotor stage because at that age infants are primarily involved in explorations involving their movements and senses. The primary feature of sensorimotor development is the growth of infants' understanding of their bodies and how their bodies relate to other things in the environment (Piaget & Inhelder, 1969).

Piaget's six sensorimotor sub-stages

Reflexive Scheme Sub-Stage

Piaget (1952) divided the sensorimotor stage into six sub-stages beginning with the *Reflexive Scheme Sub-Stage*. Infants in this sub-stage, birth through four months, gain information through their senses. Behavior for infants in this first sub-stage is purely reflexive. Some of these reflexes reflect primitive forms of behavior, such as rooting, sucking, and grasping. If a caregiver gently touches a two week old infant on his or her cheek with a soft cloth, the rooting reflex will cause the infant to turn his or her head to that side. According to Piaget, a one month old infant who is touching an object is developing an intelligent way of *knowing* that object. The infant will not only touch the object but will also taste and smell it. In this regard, Gonzalez-Mena (2001) states that "an infant's mouth is his

or her main learning tool in the first months of life" (p. 92). An older infant will turn an object over and over in his/her hands to catch every detail. These actions are the infant's first connection to the world.

A second reflex is the Moro reflex, or startle reflex. The tonic neck reflex, also called the fencer's reflex is when the baby's arm will extend in the direction in which the head is turned and the other arm will flex upward. The Palmar reflex occurs when the fingers clamp into a fist when touched lightly, just as the Plantar reflex occurs as the toes curl inward when the arch of the foot is touched. These reflexes are inborn and will occur without stimulation and tend to disappear within the first six months of life.

Most of the following sensory activities can be done by children in all the sub-stages. Caregivers should understand that the responses may vary according to age and development. Caregivers should view these activities as ways to begin sensory stimulation and as ideas to spark their own creativity and ingenuity. One such sensory experience for infants in the *Reflexive Scheme Sub-Stage* is providing hanging lights and installing wind chimes above the changing table. The young infant may follow the movement of the hanging light and may respond to the sound of the wind chimes as they move. The caregiver should always talk to the infant about what he or she is seeing and hearing as this provides essential verbal stimulation.

### Primary Circular Reaction Sub-Stage

The second sub-stage in the sensorimotor stage is the *Primary Circular Reaction Sub-Stage*. This applies to infants from one to four months. In this stage, we begin to see primary actions within the infant's own body. These actions will initially occur by chance such as cooing and coordinating arm movements with the mouth in which the baby sucks on the thumb and then repeats these actions, thus the reference to a circular reaction. Infants, one to four months, drop objects when the grasping reflex relaxes. During the *Primary Circular Reaction Sub-Stage*, this is not intentional behavior. Allowing an infant to drop items over the edge of the high chair will encourage the development of object permanence and allows for the infant to explore their effect on the environment. Infants will continue repeating a behavior that was discovered by accident.

One activity to do in the *Primary Circular Reaction Sub-Stage* is putting on lotion. The developmental goals for this activity are increasing body awareness, interacting with adults, and recognition of body parts. During diaper changing, the caregiver can remove the child's shoes, socks, and/or shirt. The caregiver should place a small amount of lotion in his or her hands and rub them together to warm the lotion. Then the caregiver can apply the lotion to the infant's chest talking to the infant in a soothing voice. The caregiver should next move to the infant's feet and rub lotion on his or her legs, feet and toes, and talk about how the lotion feels. Also, the caregiver talk to the infant about his or her tummy, arms, elbows, fingers and toes while applying the lotion. Repeated experiences in which the teacher labels body parts assists in the development of this skill. The caregiver should observe the infant carefully to make sure the lotion is not consumed orally. This activity should be used during diaper changing time, during floor time, and any other times when one-on-one experiences are an option.

#### Secondary Circular Reaction Sub-Stage

This third sub-stage occurs by chance in four to eight month old infants. Neural pathways in the brain are strengthened as infants gather, apply, and benefit from their sensory encounters (Gonzales-Mena & Eyer, 2001). If infants are to build healthy learning pathways to the brain, they need sensory experiences with numerous opportunities for repetition.

Infants are continually in the process of gathering and using information. Sensory information provides an important link to other areas of development. As infants repeat experiences, as they do in the *Secondary Circular Reaction Sub-Stage* (four to eight months), they begin to make meaningful connections about objects and people in their world (secondary). Learning for infants and toddlers is interrelated, for growth in one area influences growth in another. Infants learn to discriminate their sensory experiences. They also learn to move their bodies in specific ways to accommodate new sensory information, such as kicking the crib to make a mobile move or smiling to get another person to smile.

Between four and five months, infants develop the principle of cause and effect. By dropping toys on the floor, they learn of their personal ability to influence their environment

as they notice a chain of reactions. As a result, they will purposefully continue dropping items. Learning the *drop it* game or reaching for the wind chimes hanging from the ceiling and obtaining a response, the infant will continue to repeat the action, thereby learning a new behavior which occurs in the *Secondary Circular Reaction Sub-Stage*. The infant will revel in his or her ability to make noise. Therefore, these activities also foster the development of self-esteem and self-efficacy.

Vision bottles can be made very easily for infants to use and explore. They are small, clear, plastic bottles with lids. A variety of materials can be used, such as colored water with beads and jewels, mineral oil and colored water, corn syrup and glitter with beads, colored shredded paper, buttons and bells. Vision bottles are an excellent way for infants to explore interesting movement within. By turning the bottle and tipping it upside down, infants will focus on how the material moves and will observe that they had an impact on that movement.

#### Coordination of Secondary Circular Reaction Sub-Stage

Infants in the eight to twelve months age span are in the *Coordination of Secondary Circular Reaction Sub-Stage*. The first signs of goal-directed behavior, not motivated by chance are observed in this sub-stage. Infants will combine different circular reactions to achieve goals such as using one hand to hold an object while the other hand explores it or using one object to retrieve or act on another object. Providing infants with opportunities to explore is critical at this stage of development and can be greatly enhanced by utilizing sensory play.

Providing infants eight to twelve months of age with a variety of sensory materials, such as toilet paper, cotton balls, oatmeal, Cheerios, Cool Whip, snow, water, mashed potatoes, rice, etc., will encourage them to act on the materials in a variety of ways. Concepts such as object permanence, filling, dumping, counting, sorting, and classifying will continue to develop in the *Coordination of Secondary Circular Reaction Sub-Stage*. Sensory play promotes experimentation with materials and the tools used to interact with the materials. Infants in this stage will develop most of their knowledge by orally

experimenting with the material; therefore, educators must consider size of material and tools and what is appropriate for oral consumption.

### Tertiary Circular Reaction Sub-Stage

Sensory activities can also ease the transition into the *Tertiary Circular Reaction Sub-Stage*. At 12 to 18 months, the infant uses familiar secondary circular reactions to make new things happen. Sensory activities, such as adding water to potato buds to make a squishy mixture will create a new relationship between these materials by creating a transformation. During the *Tertiary Circular Reaction Sub-Stage*, there are also subtle changes in the children's ability to use their hands and fingers. More control is gradually developed. As a result, infants will engage in manipulating and exploring materials and objects. By using a multisensory approach, children can learn about how the material feels, looks, moves, and responds.

Another activity to stimulate this developmental sub-stage is interacting with a substance that is called *oobleck*. It is made with equal parts of cornstarch and water. Young children can help mix these two ingredients to observe the change. It will be the right consistency when it feels hard and molds in the hand. However, when the hand is outstretched, the *oobleck* appears to melt through the fingers. This substance washes easily from hands and clothing, and from carpets after drying. If the child seems particularly hesitant to play with the *oobleck* the caregiver can provide gloves or tools to use during play instead of just bare hands.

### Invention of New Means Through Mental Combinations

Finally, Piaget (1952) described the last sub-stage for infants as the time between 18 to 24 months. Infants are now able to think before acting by representing actions as mental pictures and symbols. Piaget observed that this sub-stage involves the invention of new means through mental combinations. When children are curious, they make hypotheses and experiment freely. Promoting experimentation is how creativity flourishes (Ross, 1995). Sensory play enables children to be active learners who take the opportunity to make their own discoveries. The need to experiment with cause and effect

relationships is an important component of children's development (Kamii & DeVries, 1993). Toddlers discover and learn through concrete, hands-on experiences. Cooking experiences are also important for young children because they learn through their senses--feeling, smelling, seeing, hearing, and tasting. Hence, cooking activities are a method for facilitating toddler's cognitive growth. Making muffins, pudding, bread, or any other foods can assist in the development of cognitive skills such as comparing and contrasting and by asking questions. By observing and tasting foods, the child can learn about color, texture, smell, feel, and taste of foods. Toddlers, like preschoolers, fail to recognize transformations. They treat the initial and final states of an action as completely unrelated, ignoring the dynamic transformation between them (Berk, 1997). Therefore, observing and discussing the transformation of the ingredients will enhance their cognitive development.

#### Role of equipment and materials in sensory play

Enhancing sensory play requires consideration of an assortment of issues. All types of play should be encouraged inside and outside the classroom. Children should be involved in creative, dramatic, constructive, imaginative, social, physical, and natural play. When planning a program of sensory experiences to be used in the sensori-motor stage, certain guidelines should be followed, for they give direction and focus to the sensory activities.

1. A sensory table, which is any container that holds materials for manipulating, is necessary in an infant/toddler program for exploratory learning.

This could include a flat surface table, a swimming pool, a dish tub or any commercial product designed specifically for sensory play. The location of the sensory table is vital to its effectiveness. When selecting an area to place a sensory table, one must consider easy access to a sink or water spigot for easier clean up. Slippery surfaces are hazardous; therefore, placement on an old blanket, artificial grass, or real grass is most effective for preventing spills and also for clean up purposes. Children need plenty of room for interacting with the material; therefore do not place the table against a wall. It will prevent children from using all the sides of the table and may cause crowding or disruptive behaviors.

2. The type of material used must be multidimensional.

A variety of materials are necessary for sensory play to be successful. Adding toys for measuring, scooping, digging, pouring, etc. will add complexity and offer challenging, open-ended exploration. These toys need not be expensive or specifically designed for water play.

3. When considering food as a sensory play material, educators need to be sensitive to family culture, as well as, past and present circumstances.

This sensitive consideration must come through when relating and interacting with children and their families. According to Gonzalez-Mena (1997), "...in some cultures, food is revered and is never considered a plaything, not at the eating table or at the activity table" (p. 42). Food shortages, starvation experiences, and world hunger issues may make some individuals cringe at the thought of playing with food.

4. The type of material and toys must be safe for the children.

The caregiver must consider the size of materials and toys to ensure the safety of the children. Choking is a critical issue with infants and toddlers. Choke tubes are available to check for the size of materials used. Ensure that the toys do not have sharp or pointed edges and that the toys are in good repair. Caregivers must also ensure that the children do not walk around with tools or materials in their mouth.

#### Role of the teacher in sensory play

The teacher has a fundamental role in implementation of sensory play. A good sensory environment provides space and material which encourage peer interaction, support children's capabilities, and challenge children to continue to grow. Caregivers must consider safety concerns as well as all responsibilities of the classroom when giving attention to the following guidelines as they interact with children during sensory play:

1. The teacher must understand the importance of sensory play and guide children in their play.

It is critical for teachers to be able to recognize the different concepts of learning that are being constructed through sensory play. At the sensory table, children are developing socially, emotionally, cognitively, and creatively. Knowing the benefits of sensory play will

help teachers identify the content that children are learning through play. Educators need to create environments that promote characteristics of both playfulness and work. Teachers should promote enjoyable activities that are both voluntary and self-directed.

2. Teachers must enhance their observation skills so that the sensory play is used most effectively.

Observing play is an important function of the teacher. The teacher needs to observe the children as well as how the material is being used. Observing children is important because not only are teachers making sure that the children are safe, they are also looking to see how they can support and encourage a variety of play (Frost, 1997).

3. Teachers need to involve all the children in sensory play.

Some children simply don't like messy activities. They may not like to stick their fingers in play dough or finger paint. The teacher should introduce a substance and let the child choose to touch it or not. An option would be to put gooey play substances inside a plastic zip-lock bag, allowing the child to explore without getting messy. Some teachers use soft, colorless, and sweet smelling items, such as cool whip or shaving cream. Scented water is another option. These can be less threatening than other gooey substances. Often times, the child will eventually choose to enjoy the activities at a level he or she is comfortable, leading to more active involvement at a future time.

### Conclusion

Children in these sub-stages of development are curious and anxious to explore their world. Using a hands-on, exploratory approach is an effective way to encourage infants and toddlers to construct their knowledge. Piaget is one of the leading theorists on cognitive development. Early childhood educators should analyze Piaget's work when designing a stimulating environment containing sensory-rich materials to enhance cognitive development consistent with developmental stages. Sensory play encourages exploration, experimentation, spatial relationships, and many other concepts that lead to overall development. Providing infants and toddlers with opportunities to explore is critical, and it can be greatly enhanced by utilizing sensory play.

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