
THE ROLE OF PAUD (EARLY CHILDHOOD EDUCATION) IN THE REVIVAL OF HUMAN RESOURCES

Dr. dr. Muhammad Isman Jusuf, Sp.S.

Lecturer at Faculty of Medicine, Universitas Negeri Gorontalo/Neurologist

Human Resources is the potential of humans to realize their role as social beings who are adaptive, transformative, and can manage themselves and all their potential to achieve prosperity in a balanced and sustainable order. Human Resources are also defined as people or residents who have actual or potential knowledge, skills, behavior, and abilities optimized for the community's socio-economic development.

Several data indicate that the quality of Indonesian human resources is currently encountering a deterioration. Asia Week claims that of the 77 most reputable universities in the Asian region, the quality of lecturers at the three most prominent Indonesian universities is ranked 62, 76, and 77. At the same time, the first and second places are occupied by the University of Hong Kong in Hong Kong and Tohoku University in Japan, respectively. Furthermore, the contribution of Indonesian scientific works at the international level is only 0.012%, while Malaysia is 0.076%, Singapore is 0.159%, and the United States is 30%. A survey from the International Educational Achievement (IEA) reveals that the reading ability of elementary school students in Indonesia is ranked 38 out of 39 countries studied, while the information literacy of Indonesian people is still in the bottom five in the world.

These facts are reflected in the Human Development Index (HDI), which depicts three main variables: education, health, and economic growth. Currently, Indonesia's HDI is still lagging behind many countries globally, even at the ASEAN level. In 1997, Indonesia only managed to rank 99th out of 175 countries in the world. In 2003, Indonesia's HDI ranking dropped to 112th and could only outperform several countries such as Myanmar (131st) and Cambodia (130th) in ASEAN. In 2007, Indonesia's ranking rose to 107 out of 177 countries. However, it is still not encouraging since Indonesia is still lagging behind other ASEAN countries.

The 21st century is dubbed the century of the brain and the millennium of the mind. Hence, the current criterion of quality human resources is the ownership of sustainable intelligence competitiveness. The body organ directly related to human intelligence is the brain which performs as the control center for all systems in the body. It is also the center of intelligence or the center of thinking ability.

Since the brain regulates all activities of human life, disturbances in the brain will interfere with an individual's life activities depending on the location of the disturbance. For this reason, the first step in bridging the improvement of the quality of human resources is an understanding of the structure, function, growth, and development of the brain for effective and efficient brain stimulation and nutrition.

An overview of the structure and function of the brain

Anatomically, the brain consists of three main structures: the cerebrum, cerebellum, and brainstem. The cerebrum is related to the highest mental functions. The cerebrum is divided into the right hemisphere, which controls the left side of the body, and the left hemisphere, which controls the right side of the body. The left brain is concerned with academic functions such as mathematics, logic, reading, writing, analyzing, and developing memory skills. Meanwhile, the right brain is related to creativity, such as art or sports. The link between the two hemispheres is the corpus callosum (golden bridge). Through this link, all information acquired is conveyed from left to right or vice versa. The outer layer is called the cortex, and the inner layer is called the subcortex. The subcortex contains the thalamus responsible for relaying sensory stimuli to the cortex, and the hypothalamus, which regulates body temperature, sleep, digestion, and hormone release.

The cerebrum has five lobes: the frontal, parietal, temporal, occipital, and limbic lobes. The frontal lobe is responsible for the most eminent cognitive functions: problem-solving, spontaneity, memory, language, motivation, impulse control judgments, and social/sexual behavior. The temporal lobe is responsible for feeling, smelling, perceiving, memorizing, understanding music, being aggressive, engaging in sexual behavior, and speaking. The parietal lobe regulates the sensations of touch, smell, taste, and spatial awareness. This lobe is a fundamental component of eye-hand coordination or foot movement. In addition, there is Wernicke's area in this lobe which is responsible for language comprehension. Visual function is governed in the occipital lobe. The left side of this lobe is responsible for recognizing numbers and letters, while the right side is responsible for identifying images and shapes. The limbic lobe extends deeper and forms the limbic system. This system has the essential functions of eating behavior, aggression, emotional and autonomic expression, endocrine aspects, and sexual response.

The cerebellum is the part of the brain that coordinates muscle movement. It also controls body balance and maintains posture. The brainstem is responsible for coordinating and regulating visceral activity consisting of the medulla oblongata, pons, and midbrain. The medulla oblongata is the center for breathing, blood pressure, heart rate, and swallowing functions; the pons controls eye movements and regulates breathing, while the midbrain manages involuntary movements.

Due to its vital function for the body, the brain has a protective skull that surrounds and protects the brain from the outside. Beneath the skull is membranes of the brain called the meninges. It consists of three layers: the dura mater, which contains many blood vessels; the arachnoid, which is thin and poor in blood vessels; and the pia mater, which is permeable and contains many blood vessels and nerves. There is an epidural space where the anesthetic is usually injected between the dura mater and the vertebrae. The subdural space between the dura mater and the arachnoid is the subdural space, while between the arachnoid and pia mater is the subarachnoid space. In this space, there is a cerebrospinal fluid which is a cushion for the brain.

The part of the peripheral nervous system that manages involuntary responses is called the autonomic nervous system, which consists of the sympathetic and parasympathetic nervous systems. The sympathetic nervous system is the part of the autonomic nervous system that operates when the body is active or experiencing emotional stress, while the parasympathetic nervous system is the part of the autonomic nervous system that slows down body functions.

In the brain, there are neurotransmitters, chemicals produced by neurons that are composed of a group of molecules bound to chemical units, such as endorphins, norepinephrine, dopamine, and peniletilamine. Endorphins (opioids) function to improve mood, bring pleasure, endure pain, and make happy. Norepinephrine is responsible for stimulating, creating pleasure, increasing alertness, providing motivation, reducing depression, controlling appetite, and increasing sex. Dopamine functions to feel happy, control desire, and secrete growth hormone. Peniletilamine (PEA) is responsible for feeling happy and involving other feelings. In addition, there are also major inhibitory neurotransmitters such as enkephalins which relieve pain and reduce depression, and GABA (gamma-aminobutyric acid) as anti-stress, anti-anxiety, anti-panic, sedative, and control and focus guard. Numerous hormones can also work as neurotransmitters, including serotonin, melatonin, and oxytocin. Serotonin works to improve sleep, self-confidence, improve depression, and prevent agitation and fear; melatonin plays a role in rest and healing as a habit-regulating and biorhythmic anti-aging hormone; while oxytocin is a hormone stimulated by the dopamine that can increase sexual desire and love and bind emotions and desires.

An Overview of brain development

The brain is the first organ to form. It begins with the formation of the neural plate on the 16th day of gestation. This neural plate then coils up to form the neural tube on day 22 and produces nerve cells. On day 35 or the fifth week of pregnancy, the embryo of a large brain commences emerging at the end of the neural tube. Further, the brain stem, cerebellum, and other parts are formed. At eight weeks of gestation, up to 250,000 nerve cells are produced per second. Brain growth and development transpire rapidly, especially in the third trimester at 25 weeks of pregnancy until the child is two years old.

The process of brain growth and development is complicated and goes through several stages, namely the addition of nerve cells (proliferation), transfer of nerve cells (migration), changes in nerve cells (differentiation), formation of neural networks with one another (synapses), and the production of nerve sheaths (myelination). The proliferative process takes place at about 4 to 24 weeks of gestation. The process of nerve cell proliferation is complete or stops when the baby is born. The migration process takes place from 16 weeks of gestation until the end of the 6th month. This process occurs gradually, meaning that the nerve cells that migrate earlier will occupy the inner layer, and those that migrate later occupy the outer layer (cerebral cortex). By the end of the 6th month of gestation, the cortical plate already has a complete neural cell component. At this stage, there appears to be differentiation. The myelination process occurs especially before pregnancy. The maturation of the nerve sheath reaches its peak when the baby is one year old.

The brain weight of a newborn is 350 grams and reaches 1200 grams after one year of age. The brain's weight only ranges from 2% to 3% of the total body weight, while the size of a newborn's brain reaches 25 percent of the adult brain and reaches 70 percent by one year. At this age, the baby's brain already contains 100 billion neuron cells. From that number, about 70-80 percent of the neuron cells have been completely formed.

Genetic and environmental factors alter brain development. If these two factors are not supportive, brain growth and development will not be optimal. Genetic and environmental factors cannot stand alone. Both must be interrelated and hand in hand for the brain to evolve correctly.

Nutrition for the brain

Nutrients play a notable role in promoting the growth and development of the child's brain. Nutrients needed for fetal brain development are classified into indispensable nutrients and brain-specific nutrients. Essential nutrients support the formation of brain cells while brain-specific nutrients consisting of omega-3 fatty acids, B vitamins (folic acid, vitamin B6, and vitamin B12), and antioxidants (vitamins A, C, and E) are needed for the myelination process. Substances recognized for their role are omega-3 or omega-6 fatty acids, widely found in breast milk. In the baby's body, these substances will turn into AA and DHA, which function in forming nerve cell membranes. Therefore, many formula kinds of milk incorporate AA and DHA in their nutritional composition.

According to WHO (World Health Organization) and FAO (Food and Agriculture Organization), pregnant women should take at least 2.6 g of omega-3 and 100-300 mg of DHA every day to meet the fetus's needs. Numerous studies have shown that gestational age and birth weight significantly increases when omega-3-rich foods or DHA supplements are proffered during the last trimester of pregnancy. Another study affirms that the risk of premature birth is four times less in mothers who consume omega-3 during pregnancy.

Folic acid, vitamin B12, and vitamin B6 play a role in synthesizing choline, adrenaline, and noradrenaline and maintaining healthy blood vessels in the brain to prevent defects in neural tube formation. At higher doses, these substances are provided to prevent intelligence disorders in pregnant women. Antioxidants are essential in protecting the brain against oxidative damage caused by the high-fat content in the brain.

There are abundant other substances found mainly in the brain's outer layer, namely sialic acid, which is also contained in breast milk. The function of this substance is to help enhance memory skills and learning processes that affect children's intelligence.

Stimulation for the brain

The process of directed stimulation and the migration of neurons will activate synaptic plasticity in controlling the decrease in the number of glial cells to form a synaptic network. Simultaneous stimulation will strengthen the old synapse, which makes the brain function better. Researchers at Baylor College of Medicine, Houston, United States, note that less stimulated children have a 30 percent smaller brain than children who get optimal stimulation.

The brain's learning system that is formed in the fetus consists of physical, emotional, social, cognitive, and reflective learning systems. At birth, the system will develop into a multi-intelligence potential (Multiple Intelligence, Howard Gardner). Furthermore, this intelligence resembles a potential ability possessed by every human being (Human Capacity). The following learning process will be stimulation for the optimal brain learning system.

In general, humans only use 10 percent of their brain capacity, most of which only optimizes the brain's left hemisphere. Both hemispheres of the brain need balanced stimulation so that their functions can develop optimally. It is improbable only to stimulate the left or right brain. If the stimulation is balanced, the intelligence and personality of the child will enhance. One form of brain stimulation is the mother's singing while breastfeeding, accompanied by caresses and gentle touches on the baby. In this process, the child is stimulated to communicate with his mother. The melody will stimulate the baby's right brain, while the lyrics will stimulate the left side of the brain.

Music (sound, rhythm, melody, and harmony) is employed to facilitate and stimulate communication, relationships, learning, mobilization, and expression, thereby stimulating physical, emotional, and mental abilities. The rhythmic chant and the sound of music that touches the limbic system will be translated with pleasure and happiness due to the delivery of rhythm, which is a message in the nerve endings. All messages will be consolidated in alpha waves in the brain so that a person becomes relaxed but still alert. Classical music, which has an average of 60 beats per minute, can bring the brain into a calm state, thereby relieving pain and stress. It can also help release uncomfortable emotions and, in turn, stimulate the mind, creativity, imagination, and sensitivity to the world around.

The brain can also be stimulated through physical exercise. From the aspect of brain health, physical exercise will stimulate neurogenesis or the ability of the brain to produce new neurons. Stimulation of these new neurons will form connections with other neurons more integrated with brain circuits and help the overall body function.

Government policy regarding the brain

In the preamble of the 1945 Constitution, it is stated that one of the state's goals is to educate or increase the intelligence of the people. Intelligence is the ability to adapt effectively to the environment, make changes to oneself and the environment, or produce something new. Therefore, intelligence is a combination of several mental processes through adaptation to the environment. Regarding the constitutional mandate, the government has taken various steps in the education and health sectors.

In the education sector, the government is intensifying Early Childhood Education (PAUD) activities. The 2003 National Education System Law article 1 paragraph 14 states that early childhood education is a coaching effort at children from birth to the age of six which is carried out by providing educational stimuli to assist physical and spiritual growth and development so that children have the readiness to enter further education.

PAUD includes Kindergarten, Raudathul Athfal, Playgroup, Children Daycare, Child Family Development, and Grade 1 in Elementary School. Early childhood is a golden period for child development, where 50% of children's intelligence is formed at the age of 0-4 years and the next 30% until the age of 8 years. Therefore, in 2001 the Directorate of Early Childhood Education was formed under the Ministry of National Education to promote a broad approach to early childhood and improve the quality of early childhood services.

In the health sector, based on the Regulation of the Minister of Health of the Republic of Indonesia Number 1295/MENKES/PER/XII/2007 concerning the First Amendment to the Regulation of the Minister of Health Number 1575/MENKES/PER/XI/2006 concerning the Organization and Work Procedure of the Ministry of Health, the government established the Center for Health Intelligence (PIK) which is directly under the Minister of Health.

The Center for Health Intelligence is in charge of formulating policies for maintaining and improving health intelligence capabilities and overcoming health intelligence problems. As with organizational units at the echelon II level, PIK aims to realize the optimal quality and highly competitive Indonesian human intelligence. To realize this vision, PIK has set five missions: 1) increasing the attainment of high intelligence from an early age to the elderly, 2) optimizing the factors that support brain potential appropriately from conception to the elderly, 3) increasing health intelligence with stimulation by a conducive environment in various age groups, 4) optimizing the mindset that can change the attitudes and behavior of human resources, and 5) overcoming intelligence problems caused by various kinds of disorders.

One of the activities currently being carried out by the Center for Health Intelligence is the Brain Booster program, which is an effort to stimulate intelligence potential and fulfill brain nutrition during pregnancy simultaneously.

The policy regarding the brain is not only the domain of the central government but also the local government. As one of the efforts to educate the people, the Gorontalo Provincial government plans to establish a Provincial Hospital, which is directed to become a Brain hospital. This hospital is expected to integrate all types of services for brain health (brain check-up) from the promotive, preventive, curative, to rehabilitative stages, apply a holistic and multidisciplinary approach, and reach all levels of society from an early age to the elderly, which in turn will improve the quality of Gorontalo's human resources.

One hundred years ago, dr. Wahidin Sudirohusodo and the founders of this republic realized that Indonesia could be free from colonialism and equal to other nations only through educating the people. For this reason, Budi Utomo was established, which was then followed by other movement organizations. Through the commemoration of the national awakening day, we are reminded to continue the struggle of these pioneers through efforts in the education and health sectors to create quality human resources who have intellectual, emotional, and spiritual intelligence. These quality human resources are expected to bring this big boat called Indonesia anchored at the final port called "baldatun thoyyibatun wa robbun ghofuur." Amen!

Bibliography

1. Kemendikbud RI, 2012. *Pedoman penyelenggaraan program pendidikan anak usia dini, non Formal dan formal*, Jakarta
2. Siswanto H, 2010. *Pendidikan kesehatan anak usia dini*, Pustaka Rinama, Yogyakarta
3. Soetjiningsih, 2016. *Tumbuh Kembang Anak*, EGC, Jakarta
4. Sulyadi HM, 2013. *Konsep dasar PAUD*, Rosda Karya, Bandung