

# The Influence of Sensomotor Stimulation on Arousal Levels and Normal Children Attention in A Primary School in Depok, Indonesia

Emi Nurjasmi and Ari Sudarsono

**Abstract---** Ability to follow and concentrate forms the basis for most functions - cognitive function. One of stimulation that can improve attention is sensomotor stimulation which is stimulation through general sensory innervation system (touch, taste, motion, vibration, temperature, and pain) and special sensory fibers (visual, auditory, kinesthetic) with the aim to improve entire central admission system in the cerebral cortex receptive. In term of the importance of children having optimal levels of arousal and attention in a process of learning in elementary school education encourages researchers to conduct this research. This study is a quasi-experimental study in which researchers intervened sensomotor stimulation with various forms of activities that stimulate different senses sensory. The purpose of this study is to look at the effectiveness of sensomotor stimulation in normal children aged 6-8 years attending primary school. The study population was normal children aged 6-8 years in Primary School 01 Pasir Putih, Sawangan, Depok. The number of samples is in accordance with a population that is 68 people by purposive sample using pretest and posttest control group which is simple experimental design, with the initial measurement or observation before treatment is given. One group of subjects was given treatment, while the other group was given no treatment. Results showed Stroop test scores before and after treatment in group I were analyzed by Paired Samples Test showed that sensomotor stimulation produces significantly changes on Stroop test scores ( $p < 0.05$ ). Furthermore, there was no significant difference ( $p > 0.05$ ) between groups I given sensomotor stimulation and group II were given free play.

**Keywords---** Sensomotor Stimulation, Arousal, Attention.

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## I. INTRODUCTION

The 2010 Indonesian health demographic census (IDHS) showed that the number of early childhood (0-6 years) is 26.09 million. Of this amount, 13.5 million of them aged between 0-3 years and children aged 4-5 years reached 12.6 million children, and of these, children around 14.08% of children experience developmental delays (Setyowati, 2012). Based on preliminary observations made in the field, namely Primary School 01 Pasir Putih, Sawangan, Depok in February 2012 found 7 out of 10 parents interviewed stated that children up to the age of 8 years are still wet, unable to go to school alone and cannot concentrate on doing homework. The child's development needs to be monitored to avoid disturbances that occur can be immediately known and sought efforts to overcome. This early stimulation is important so that actions to pursue developmental delay can be carried out immediately (Bonnier 2008). Developmental delay that is left too long can become a disorder or disability that is difficult to repair. In the development of children there is a critical period, where necessary stimulation or

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stimulation is useful for the potential to develop, so it needs to get attention. Stimulation is one factor in achieving cognitive development is the effort of parents or family to invite children to play in an atmosphere full of joy and affection. These play activities and the atmosphere of love are important in order to stimulate the entire sensory system, practice fine and gross motor skills, communication skills and children's feelings and thoughts (Dunn 1997). Stimulation from an early age is one of the most important external factors in determining a child's development.

One of the stimulations that can increase attention is sensomotor stimulation that is stimulation performed through the general sensory innervation system (touch, taste, motion, vibration, temperature and pain) and special sensory fibers (visual, auditory, kinesthetic) with the aim to improve the whole center of the receptive reception system in the cortex of the brain. The ability of parents to provide developmental stimulation to their children can be caused by many factors including socioeconomic, education level and number of children. Inability to provide stimulation will make people tend to let children develop as they are without external stimulation while they also provide excessive protection to their children so that it inhibits the readiness to develop children's abilities, many lay people, especially parents argue that growth and development problems that occur in children can be reduced even disappear alone with the passage of time as a child ages. Considering the importance of children having arousal level and attentional attention in the process of learning in formal elementary school education encourages researchers to conduct research on the effects of sensomotor stimulation on arousal levels and attention of normal children aged 6-8 years at Primary School 01 Pasir Putih, Sawangan, Depok.

## **II. THEORETICAL FRAMEWORK**

### ***2.1. Arousal Physiology and Attention***

Arousal and attention are more complex functions of the brain in integrating the input/sensory processes. Arousal is a state of responsiveness to stimulation/action or a state of physiological readiness for activity. Attention is awareness of the environment or selective response to stimuli while cognition is the action or process of knowing, being ready, and deciding on an action. Both are important foundations in the process of learning and cognitive development. The ability to follow and concentrate forms the basis for most cognitive functions. Many different attention processes work together to process information. These processes include alertness or arousal, namely the ability to choose various stimuli, the ability to reach attention, move attention and process information. Attention is thought to be a continuous process rather than an isolated process involving intensive concentration and the ability to inhibit things that confuse the mind and the ability to shift the locus of attention according to external and internal needs. Early childhood is a golden period in the development span of an individual. At this time, physical growth, development of intelligence, motor skills and emotional social progress so rapidly. Early childhood development is also a critical period that will determine the outcome of the child's subsequent growth and development process. During the development of toddlers, children experience changes that occur in terms of changes in body structure and functions that are more complex in gross motor skills, fine motor skills, speech and language as well as socialization and independence (Soetjningsih, 2005).

The ability to follow and concentrate forms the basis for most cognitive functions. Many different attention processes work together to process information. These processes include alertness or arousal, namely the ability to

choose a variety of stimuli, the ability to reach attention, move attention and process information. Attention is thought to be a continuous process rather than an isolated process involving intense concentration and the ability to inhibit things that confuse the mind and the ability to shift the locus of attention according to external and internal needs. Arousal or alertness/preparedness is defined as the general readiness of the central nerve to receive and act on information. It is seen as an involuntary action of the nervous system and depends on incoming sensory information. Arousal tends to change the overall level of responsiveness of the entire nervous system. The normal level of arousal or alertness changes throughout the day. These changes generally affect a person's speed of awareness and respond to stimulus and not just the process itself. The neural structures involved with arousal or this preparedness are the reticular formation and the thalamus nucleus.

The choice of stimulus which is followed is influenced by the reticular activation system, which acts as a filter for sensory input and influences our arousal state. Selective attention can be directed externally or internally (e.g. with the presence of past memory). Attention consists of 3 levels or types. The first is action which is irresistible and vital. The second is actions determined by an involuntary desire but can be held back by our will. The third is the action determined by deliberate will. The concentration is the ability to maintain attention over a long period of time. The ability to maintain attention is counted either with tasks/active or automatic tasks. The new thing and complexity are strong motivators in maintaining attention. Field transfer is the ability to stop direct attention on a task and give attention to another task.

## ***2.2. Sensomotor Methods for Increasing Arousal and Attention***

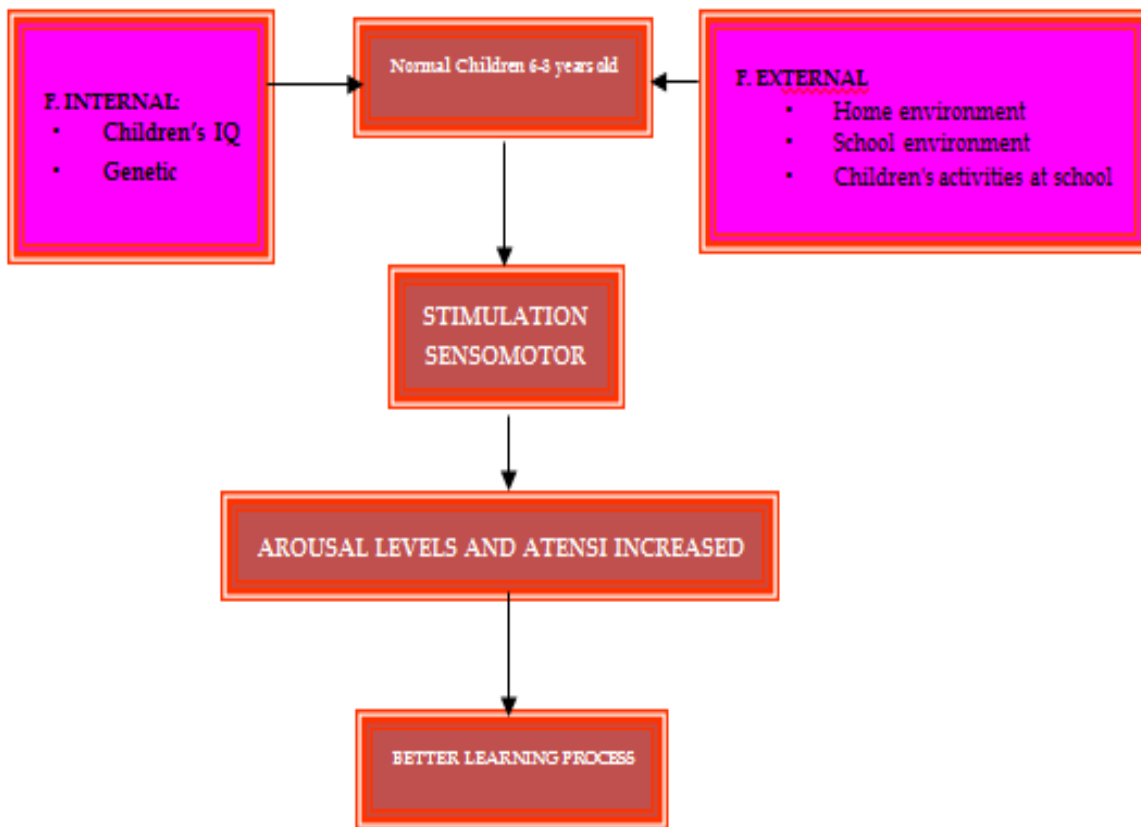
The human brain is part of the nervous system found in the body. In the organization of the human brain is divided into several parts, namely the forebrain, hindbrain and midbrain, and in it there are brainstem and the last is the spinal cord or spinal cord which is the place where nerve pathways pass both into the brain. Humans are the most perfect living things, this can be known by the continuity between the work of the human brain and the development of senses, so that humans can anticipate anything that can stimulate the brain and then physiologically occur a series of answers to the stimulation in various forms of behavior, psychomotor actions, emotions, affections, personalities and intellectual programs.

The three basic functions of brain organization are the functions of regulation, process and formulation. The regulatory function is responsible for overall cortex energy and tone levels. The process of locating the process behind the cortex, controls information analysis, coding and storage. The higher cortex is responsible for processing sensory stimuli such as visual, auditory and olfactory stimuli. Data from each source is combined with other sensory sources for analysis and formation. The formulation process is located in the frontal lobe, responsible for the formation of intention and behavior. Its main function is to activate the brain for regulation of attention and concentration.

The area of visual and somatosensory reception is integrated in the parietal lobe while the auditory reception is located in the temporal lobe. Short fibers connect the Broca area with the lower rolandi cortex which innervates the speech organs, lip muscles, tongue, pharynx and larynx. The Exner writing area is also integrated with the motor organs for the hand muscles, the perisylvian discussion area is also connected with the striata and thalamus and the

correspondence area in the non-dominant hemisphere through the corpus callosum and anterior commissure. One of the stimulations that effectively increase attention is sensomotor stimulation that is stimulation performed through the general sensory innervation system (touch, taste, motion, vibration, temperature and pain) and special sensory fibers (visual, auditory, kinesthetic) with the aim to improve the entire center of the receptive reception system in the cortex of the brain so that the desired motor activity is produced as a reflex or a direct reaction of sensory stimulation given and an indirect reaction of frontal lobe activity thereby stimulating attention and concentration.

### III. THEORETICAL FRAMEWORK AND HYPOTHESES



The hypotheses were formulated as follows:

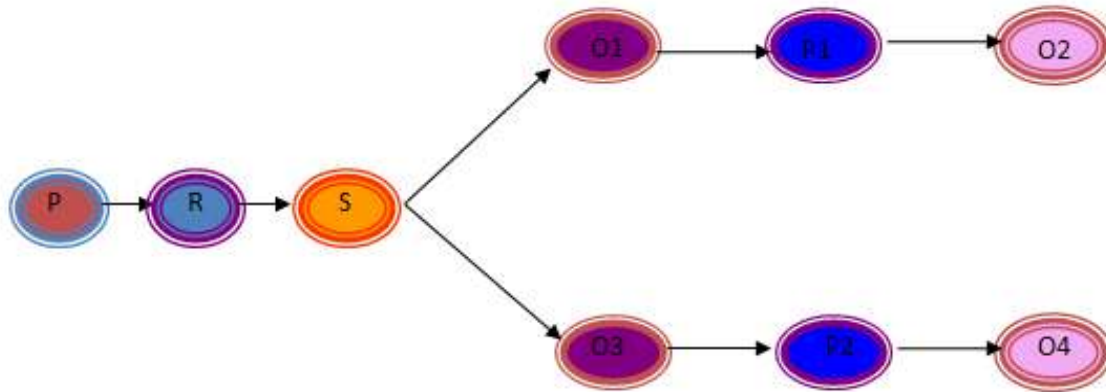
H1: There is an effect of sensomotor stimulation on arousal and attention levels.

H2: There is a difference in arousal level and attention between sensomotor stimulation and free play.

### IV. METHOD

This research is an analytical descriptive study carried out in a cross sectional way to see the effect of sensomotor stimulation on arousal levels and attention of normal children aged 6-8 years. This study is a quasi-experimental study using a pretest & posttest control group design by measuring or preliminary observations before

treatment is given then one group of subjects is given sensorimotor therapy, while the other group is given a placebo in the form of free play.



Information: P = Population; R = Randomization; S = Sample; O1 = Preliminary data on motor sensory stimulation groups; O3= Preliminary data on the placebo group; P1 = Group I Treatment: Sensomotor stimulation; P2 = Group II Treatment: Placebo (free play); O2= Final data on group sensory motor stimulation; O4= Final data on placebo group

The numbers are not large and children aged 6-8 years like to group, making the decision of all populations utilizing the saturated sample method by taking into account the inclusion and exclusion criteria. The sample was taken was grade 1 children consisting of classes 1A and 1B. For, exclusion criteria, there are from suffering from illness or taking drugs while in the range of research. For inclusion, the criteria are those with healthy body, 6-8 years old and capable of understanding the instructions given. The research will be conducted at Primary School 01 Pasir Putih, Sawangan, Depok from May - October 2012.

The study was conducted after being approved by the Risbinakes team and obtaining approval from the Depok City Education Agency. Before taking action, there is also a direction to the teacher and parents and sign the informed consent form. Tools for collecting data are by using scales and meters to measure weight and height and test sheet "Stroop Word & Color Test" to find out the speed and accuracy and measure the level of arousal and attention.

For variable definition, age is measured by year with ratio scale. Motor sensory stimulation is defined as the stimulation is carried out through the general sensory nervous system (touch, taste, vibration, temperature and pain) and special sensory fibers (visual, auditory and kinesthetic) with the aim to improve the entire receptive reception center system in the brain cortex, measured by dose and measuring results of minute and using ordinal scale. Arousal and attention refer to complex functions of the brain in integrating the input (sensory) processes that enter. Arousal is defined as a state of responsiveness to stimulation/action or a state of physiological readiness for activity. Attention is defined as an awareness of the environment or selective response to stimuli measured by Stroop Test, the measuring results of number of correct answers/second, by using ratio scale.

Data processing is done by writing the results of height, weight and BMI checks in Microsoft Excel. For checking with color and word test stroop data processing includes editing, coding and data entry using SPSS 10.05 and the results obtained are analyzed using a statistical test T-test. Anthropometric nutrition status is defined as the nutritional status based on physical size measured by body mass index, and measuring results Kg/m<sup>2</sup> and using ratio scale.

## V. RESULTS

From the results of the treatment that has been carried out on the two treatment groups, each group 1 with sensorimotor stimulation treatment and group 2 with free play treatment, the data is obtained for analysis. Preliminary data obtained in the form of characteristics of the physical conditions of research subjects which include, age, height, weight, and body mass index (BMI). This study uses 68 research subjects divided into two groups equally. The study was conducted in a single blind in which the researchers conducted the treatments themselves for both groups of research subjects (Table 1).

Table 1: Weight, height and BMI (group I)

	Age		Weight		Height		BMI	
	I	II	I	II	I	II	I	II
Mean	7.34	7.28	20.88	20.53	131.03	126.32	12.39	13.20
Median	7.33	7.33	20.00	20.00	130.00	120.00	12.44	13.89
Mode	7.08	7.50	20	20	120 <sup>a</sup>	120	13.89	13.89
Std. Dev	.415	.419	2.941	2.77	14.501	15.091	2.25	2.76

To determine the statistical test that will be used, the normality of the results of the stroop test will be carried out before and after the training (Table 2). The number of samples is > 30, the normality test uses the Kolmogorov Smirnov test. The normality test results for the stroop test scores before training all groups were normally distributed ( $p > 0.05$ ). Likewise, the data after training in the two groups were normally distributed. ( $p > 0.05$ ) (Table 3).

Table 2: Stroop test before and after treatment

	Mean	Std. Deviation
Stroop Test Value Before Group I Treatment	73.32	4.847
Stroop Test Value After Group I Treatment	84.35	4.119
Stroop Test Value Before Group II Treatment	74.47	5.310
Stroop Test Value After Group II Treatment	84.82	5.190
Difference in Stroop Test Value in Group I	11.03	2.969
Difference in Stroop Test Value in Group II	10.35	3.064

Table 3: Normality

	Group I	Group II
Stroop Test Value Before Treatment	.110	.110
Stroop Test Value After Treatment	.126	.119
Difference in Stroop Test Value in Group I	.099	.113

For testing the hypothesis about the value of the stroop test before and after treatment for sensorimotoric stimulation, paired samples test was used to determine the difference in the value of the stroop tests before and after training in each group (Table 4).

Table 4: Paired Sample Test

Stroop Test (Before – After)	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Dev	Std. Error	95%				
				Lower	Upper			
Group I	-11.029	2.969	.509	-12.065	-9.993	-21.658	33	.000
Group II	-10.353	3.064	.525	-11.422	-9.284	-19.704	33	.000

Table 4 shows the value of the stroop test before and after treatment in group I analyzed by the Paired Samples Test showing that sensomotor stimulation produced a significant change in the value of the stroop test ( $p < 0.05$ ). In group II, the Paired Samples Test showed that free play produced a significant change in the value of the stroop test ( $p < 0.05$ ). Stroop test values after the treatment used are the results that are measured as soon as the treatment is finished. Next, to analyse the hypothesis about the changes in the value of the stroop test in the two groups, this different test aims to compare the difference between the results of the stroop test scores between group I (sensomotor stimulation) and group II (free play) (Table 5).

Table 5: Difference in Stroop Test test of treatments between Group

Equal variances	Levene's Test		t-test					95%	
	F	Sig.	t	df	Sig.*	Mean Diff.	Std. Err	Lower	Upper
assumed	.000	.987	.924	66	.359	.676	.73	-.784	2.137
not assumed			.924	65.93	.359	.676	.732	-.784	2.137
*(2-tailed)									

Table 5 shows the difference in the value of the stroop test between before and after training in groups I and II analyzed by the Independent Samples Test shows that the treatment of sensomotor stimulation and free play given did not have a significant difference ( $p > 0.05$ ). Thus, that sensomotor stimulation and free play have an equally good effect on arousal levels and children's attention as measured by stroop tests.

## VI. DISCUSSION

In terms of the condition of the research subject, the subjects were 68 grade 1 elementary school children divided into two groups with 34 members each. Data on physical characteristics obtained were age, height, weight, and BMI. In the average age of group one is 7, 27 years with a BMI of 12.39 while the average age of group two is 7, 33 years with a BMI of 13.2 years so that of the age criteria and BMI of this subject meet the criteria for taking treatment which are given.

The distribution of research subjects between the two groups before and after training, normality tests were conducted with the Kolmogorov Smirnov Test, while the homogeneity of variance between the two training groups was tested with the Levene Test. The variables tested were the stroop test scores in each group and the difference between the stroop scores in the two groups. The normality test results (Saphiro Wilk-Test) prior to the treatment of the stroop test values of all groups were normally distributed ( $p < 0.05$ ). Likewise, the data after treatment in both groups were normally distributed. ( $p < 0.05$ ). The results of the homogeneity test (Levene-Test) show the value of the stroop test before treatment  $p > 0.05$ , which means the data is homogeneous. Thus, both groups before treatment, after treatment were normally distributed and data before treatment were homogeneous so that it was parametric data.

In term of the effects of sensomotor stimulation on arousal and attention levels, the results show the value of the stroop test before and after treatment in group I analyzed by using the Paired Samples Test showing that sensomotor stimulation resulted in a significant increase in the value of the stroop test ( $p < 0.05$ ). These results are in accordance with various studies which state that sensomotor stimulation can improve children's arousal, attention or memory. Meehan (2008) mentioned the existence of motor involvement during the process of receiving information (sensory) and shows the importance of it in understanding how to process information from the environment. Chan et al. (2010) by systematically analyzing the multisensory effect of many sensory environments in relation to results of 132 studies identified that 17 of which met the criteria for review. The evidence supports that the study participants showed more positive behavior after doing multisensory therapy. Also has an effect on increasing positive emotions from research participants.

In terms of the influence plays freely on the arousal and attention level, the results show the value of the stroop test before and after treatment in group II analyzed by the Paired Samples Test shows that sensomotor stimulation results in a significant increase in the value of the stroop test ( $p < 0.05$ ). This is possible because playing is an aerobic activity that also requires sensomotor integration capabilities. These results are consistent with Blanchette et al. (2005), Nurjasmı & Sudarsono (2013) and Pontifex (2012) stating that aerobic activity can increase arousal and attention.

Furthermore, regarding the differences in the effect of sensomotor stimulation versus free play on arousal and attention levels, the results show the differences in the value of the stroop test before and after treatment in groups I and II analyzed by the Independent Samples Test shows that sensomotor stimulation or free play does not produce a significant difference ( $p > 0.05$ ). In connection with the insignificant difference between groups I and II is likely because when giving sensomotor stimulation which is only 3 times a week and only for 3 weeks of treatment. If the stimulation is done 5 times a week for at least 2 months then it is likely that there will be results in the form of significant differences.

## VII. CONCLUSIONS

The results showed that the sensomotoric stimulation has a significant increase in arousal and attention ( $p < 0.05$ ) of 0.00. There is no significant difference in the results between treatments I and II so that sensomotor stimulation and free play can be used as a way to improve arousal and attention of grade 1 children in primary schools. Sensomotor stimulation and free play can increase arousal and attention levels so that it can be used as the first choice for children in the first year of primary school for teachers or parents of students. Further research is needed on arousal improvement and attention with other methods and the research period needs to be extended to get better results.

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