

***ATTENTION AND CONCENTRATION ABILITIES, THE DIFFERENCE BETWEEN STUDENTS WHO HAD BREAKFAST AND STUDENTS WHO DID NOT HAVE BREAKFAST IN UPTD SMA NEGERI 2 NGANJUK***

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***ABSTRACT***

*Indonesia had the lowest position in cognitive skills and educational achievement, according to the research of the Economist Intelligence Unit in 2014. Attention and concentration are parts of the cognitive domain. Attention is the ability to focus on problems. Concentration is the ability to maintain attention for a longer period of time. The availability of adequate nutrition can be achieved by consuming good and various foods, especially at breakfast. This research aimed to study the difference in attention and concentration abilities between students who had breakfast and those who did not (kata kerjanya apa?) in UPTD SMA Negeri 2 Nganjuk. The subjective assessment used a questionnaire, and the objective assessment used Moca-Ina. This (Kata "This" ini sebagai kata ganti apa, harus jelas) was analytic research with a cross-sectional research design applied to 42 eleventh grade students in UPTD SMA Negeri 2 Nganjuk. The sampling technique was Simple Random Sampling by distributing the questionnaire and performing Moca-Ina. To analyze differences in attention and concentration using Chi-square test and Mann-Whitney U, with  $\alpha \leq 0,05$ . The result showed that there were significant differences in the attention and subjective concentration abilities between students who had breakfast and students who did not have, based on the breakfast menus ( $p=0.012$ ), breakfast calories ( $p=0.012$ ), and breakfast time between those who had breakfast at 06.00–06.59 a.m.–06.59 a.m. and who did not have or had breakfast before 06.00 a.m.a.m. ( $p=0.004$ ). Also, there were significant differences of attention and objective concentration abilities among students who had breakfast and students who didn't have ( $p=0.035$ ) based on Moca-Ina. The researcher could conclude that subjectively and objectively, there were significant differences in attention and objective concentration abilities between students who had breakfast and those who*

*didn't. Respondents who had breakfast had better attention and concentration abilities than the ones who did not have.*

**Keywords:** *Concentration, Breakfast, Subjective, Objective, MoCA-Ina*

## **ABSTRAK**

Indonesia menduduki peringkat terakhir dalam hal *cognitive skills* dan pencapaian menurut penelitian *Economist Intelligence Unit* pada tahun 2014. Atensi dan konsentrasi merupakan bagian dari domain kognitif. Atensi adalah kemampuan untuk memusatkan perhatian pada masalah yang dihadapi. Konsentrasi merupakan kemampuan untuk mempertahankan atensi dalam periode yang lebih lama. Ketersediaan nutrisi yang adekuat untuk fungsi otak yang baik dapat tercapai apabila didukung dengan konsumsi pangan yang baik dan beragam, terutama saat sarapan. Tujuan penelitian ini untuk mengetahui perbedaan atensi dan konsentrasi siswa antara yang sarapan dan yang tidak sarapan di UPTD SMA Negeri 2 Nganjuk, secara subyektif menggunakan kuesioner dan secara obyektif menggunakan penilaian Moca-Ina. Penelitian ini merupakan penelitian analitik dengan desain penelitian *cross-sectional* terhadap 42 siswa kelas XI UPTD SMA Negeri 2 Nganjuk. Teknik pengambilan sampel adalah Simple Random Sampling dengan menyebar kuesioner dan melakukan assessment Moca-Ina. Pengolahan data menggunakan uji Chi square dan Mann-Whitney U, dengan  $\alpha \leq 0,05$  (?). Hasil penelitian menunjukkan bahwa terdapat perbedaan signifikan antara kemampuan atensi dan penurunan konsentrasi secara subyektif antara siswa yang sarapan dan siswa yang tidak sarapan dilihat dari banyaknya menu sarapan ( $p=0,012$ ), dilihat dari banyaknya kalori sarapan ( $p=0,012$ ), serta dari waktu sarapan antara siswa yang sarapan pada pukul 06.00-06.59 pagi dan siswa yang tidak sarapan atau yang sarapan <06.00 pagi ( $p=0,004$ ). Selain itu, terdapat perbedaan signifikan antara kemampuan atensi dan konsentrasi secara obyektif antara siswa yang sarapan dan siswa yang tidak sarapan ( $p=0,035$ ) dengan menggunakan assessment Moca-Ina. Dapat disimpulkan bahwa terdapat perbedaan signifikan antara kemampuan atensi dan konsentrasi antara siswa yang sarapan dan siswa yang tidak sarapan baik secara subyektif maupun obyektif. Siswa yang sarapan memiliki atensi dan konsentrasi lebih baik daripada responden yang tidak sarapan.

**Kata Kunci:** Konsentrasi, Sarapan, Subyektif, Obyektif, MoCA-Ina.

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## INTRODUCTION

World-wide research conducted by the Economist Intelligence Unit in 2014 in 40 countries and one region (Hong Kong) said that Indonesia was last in terms of cognitive skills and educational attainment. This (Kata "This" ini sebagai kata ganti apa, harus jelas) showed that students' cognitive abilities in Indonesia required special attention. According to Batjer in 1990, cognitive function is the whole process in which an individual receives, records, stores, and uses information. Cognitive domain, including attention, language, memory, visuospatial, executive function (8).

Attention is the ability to focus (concentrate) on problems. Focused attention is essential in learning. According to Perdossi (Persatuan Dokter Spesialis Saraf Indonesia), in 2008, concentration is the ability to maintain attention over a longer period (10).

Children can concentrate on lessons if they can focus on what they

are learning. Many factors affect children's concentration, including unpreparedness of children to receive lessons, physical conditions, psychological conditions, learning modalities, noises from TV, radio, or other disturbing sounds, and fulfillment of nutrients in the morning (reference ditulis sebelum tanda titik). (13). Adequate nutrition can be achieved if it is supported by good and various food consumption, especially breakfast (6).

Various research results on breakfast conducted from 2002 to 2011 in Indonesia showed that between 16.9-59% of children in various big cities did not eat breakfast due to various factors (3). This study assessed the comparison of students' attention and concentration between those who had breakfast and no breakfast subjectively using a questionnaire and objectively using the Indonesian version of the Montreal Cognitive Assessment (MoCA-Ina) at UPTD SMA Negeri 2 Nganjuk.

## METHOD

This study was an analytic study with a cross-sectional research design. The sample in this study were students of class XI at UPTD SMA Negeri 2 Nganjuk in the 2015/2016 academic year who met the inclusion criteria and out of the exclusion criteria. The sample size was 20 respondents who had breakfast and 20 respondents who did not. The sampling technique in this study was Simple Random Sampling, by distributing questionnaires and conducting MoCA-Ina assessments to class XI UPTD SMA Negeri 2 Nganjuk academic year 2015/2016 in July-August 2015.

### Inclusion criteria:

1. Students who had breakfast, the number of calories for breakfast is 266-400 kcal.
2. Students who did not have breakfast but were not fasting.
3. Students were not in strenuous physical activity

### Exclusion criteria:

1. Taking supplements to enhance concentration.

The process of collecting data was performed by distributing questionnaires and conducting MoCA-Ina assessments to respondents with the assistance of several partners who had been trained by the researchers. Before distributing the questionnaires and conducting the MoCA-Ina assessment, the researchers explained the aims and objectives of the study and then distributed the agreement sheet to the respondents. The interested respondents would fill out the questionnaire. After the respondents filled out the questionnaire, the researcher divided the students into two groups; one group was the class XI students who had breakfast, and another group was those who did not. Then the researcher conducted a MoCA-Ina assessment in both groups assisted by a partner. In collecting this data, the MoCA-Ina assessment was carried out by examiners (researchers and partners) to the student individually.

The questionnaire results grouped students who had breakfast and students who did not have breakfast, and then the MoCA-Ina assessment was carried out.

Subjective assessment of students' attention and concentration used a questionnaire to determine the signs of decreased concentration, while the objective assessment used the MoCA-Ina assessment.

Statistical test of nonparametric correlation analysis with nominal data

to analyze differences in attention and concentration subjectively using a questionnaire with Chi-square test and objectively using MoCA-Ina was performed using Mann-Whitney U test with a computer program, with  $\alpha \leq 0,05$ .

**Table 1.** Table of Breakfast Distribution for Students in UPTD SMA Negeri 2 Nganjuk for the 2015-2016 Academic Year

<b>Breakfast Distribution</b>	<b>N</b>	<b>%</b>
Had Breakfast	22	52.38
Did not have breakfast	20	47.62
Total	42	100

**Table 2.** Table of Distribution for Number of Breakfast Menus with Decreased Subjective Concentration of UPTD Students at SMA Negeri 2 Nganjuk Academic Year 2015-2016

<b>Breakfast Menu</b>	<b>Subjective Concentration</b>						<b>Total</b>	
	<b>Did not feel a decrease in concentration</b>		<b>Felt one symptom</b>		<b>Felt two symptoms</b>			
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
No Breakfast Menu	3	7,1	10	23,8	7	16,7	20	47,6
More than 3 Breakfast Menus	13	31	6	14,3	3	7,1	22	52,4
Total	16	38,1	16	38,1	10	23,8	42	100

**RESULTS**

The results of the Chi-Square test based on the probability (significance) are known to be asimp. sig of 0.012 ( $0.012 \leq 0.05$ ), so it could be concluded that there was a

significant difference in attentional ability and a subjective decrease in concentration between students who had breakfast and students who did not eat breakfast in this study.

**Table 3.** Table of Distribution of Number of Calories in Breakfast with Decreased Subjective Concentration of UPTD Students at SMA Negeri 2 Nganjuk Academic Year 2015-2016

Breakfast Calorie	Subjective Concentration						Total	
	Do not feel a decrease in concentration		Feeling one symptom		Feel two symptoms			
	N	%	N	%	N	%	N	%
No Breakfast Portion (0 kcal)	3	7,1	10	23,8	7	16,7	20	47,6
Breakfast Portion (266-400 kcal)	13	31	6	14,3	3	7,1	22	52,4
Total	16	38,1	16	38,1	10	23,8	42	100

**Table 3.** Table of Distribution of Breakfast Time with Decreased Subjective Concentration of UPTD Students of SMA Negeri 2 Nganjuk 2015-2016 Academic Year

Breakfast time	Subjective Concentration						Total	
	Did not feel a decrease in concentration		Felt one symptom		Felt two symptoms			
	N	%	N	%	N	%	N	%
No Breakfast or Breakfast <6.00am	4	9,5	12	28,6	8	19,0	24	57,1
Breakfast 6.00-6.59 AM	12	28,6	4	9,5	2	4,8	18	42,9
Total	16	38,1	16	38,1	10	23,8	42	100

In this study, it was found that there were differences in attention and concentration abilities between students who had breakfast and students who did not have breakfast at UPTD SMA Negeri 2 Nganjuk subjectively using a questionnaire seen from the distribution of breakfast and the number of breakfast menus, the result of asimp. Sig (Sebaiknya tidak ditulis demikian) was 0.012 ( $p < 0.05$ ) the number of calories for breakfast, breakfast time between

students who ate breakfast at 06.00-06.59 a.m. in the morning and students who did not eat breakfast or who ate breakfast < 06.00 a.m. 06.00 a.m., with the results of asimp.sig was 0.004 ( $0.004 \leq 0.05$ ), and symptoms of decreased concentration), and objectively using assessment MoCA-Ina (seen from digit forwards and backward and serial seven). The significant correlation between attention and concentration ability (objectively) between students who

had breakfast and students who did not have breakfast objectively had a degree of significance or p-value of 0.035.

## **DISCUSSION**

Having breakfast is important for students because it gives them enough energy to do their daily activities. By having breakfast, students will get carbohydrates to increase blood sugar levels. Carbohydrates from food are the main source of glucose for the body. Glucose is the main source of energy for the brain to increase children's concentration ability and memory, and it is expected to improve children's performance (5). Many people do not get used to having proper breakfast in the morning because they assume drinking water/coffee/tea is proper. Eating a small piece of cake and having breakfast at 10 .m.a.m. during school or work breaks is considered breakfast (9).

The research done at UPTD SMA Negeri 2 Nganjuk found that many respondents used to have breakfast. In accordance with the research done by Maidarmi and her colleagues in 2013 at SMA Negeri 1

Padang. They found that 76.7% of students had breakfast when they were working on the research. A total of 42.2% of students always had breakfast, 24.1% of students often had breakfast, 28.4% of students rarely had breakfast, and 5.2% of students never ate breakfast (6).

Nutrition maintains adequate brain function by ensuring the availability of neurotransmitters. Adequate nutrition can be achieved if students consume good and various food consumption on breakfast (6). A study at UPTD SMA Negeri 2 Nganjuk found that 95.45% of children consumed rice. Rice is the most popular food (the highest consumption participation) at breakfast. According to Susanti in 2013, a good breakfast contains enough carbohydrates because the carbohydrate we consume in the morning will stimulate glucose and micronutrients in the brain so that it can increase passion and concentration in receiving lessons (12). In Stuber's 2014 study, nutritional intake that combined protein, carbohydrates, and glucose had been shown to improve students' cognition, concentration, and energy

levels (11). Under normal circumstances, the central nervous system can only use glucose as an energy source. In the process of absorption, glucose is actively absorbed using protein and energy transport. It means that if there is insufficient protein, the process of transporting glucose as a brain nutrient will be disrupted, which causes the brain to experience a lack of glucose which will affect concentration (14).

A good breakfast calorie in most respondents indicated the fulfillment of calories in the morning that the body needs to start the activities (12). The results of the statistical test showed that this difference had significance ( $p \leq 0.05$ ). Subjectively, it can be concluded that in this study there was a significant difference in the attention ability and concentration between students who had breakfast and students who did not have breakfast (as seen from the number of calories for breakfast). The symptoms of decreased concentration were: drowsiness (15.3%); difficulty in thinking (15.3%); sleepy and hungry (19.2%); hunger and difficulty in thinking (7.6%); hunger, difficulty

in thinking, slow memory, and drowsiness (3.9%); hunger, blurred vision, difficulty in thinking, fatigue (3.9%); dizziness (3.9%); hungry (19.2%); hunger, difficulty in thinking, and slow memory (3.9%); hunger and slow memory (3.9%); hungry and dizzy (3.9%).

Susanti's research in 2013 at SD Negeri 3 Canggus showed that the average breakfast calorie consumed for four days by 51 respondents was 306.17 Kcal. That was classified as good with a median value of 313.96 Kcal, and the most frequent value was 313.96 Kcal. Most respondents had good breakfast calories (266 – 400 Kcal) for 40 respondents in total (78.4%), ten respondents (19.6%) who had few breakfast calories (<266 Kcal), and one respondent (2%) had more breakfast calories (> 400 Kcal). In this study, all respondents had good nutritional status and obtained a good average value of calories (12).

In this study, it was found that students who had breakfast had fewer symptoms of decreased concentration (subjectively); according to Susanthi in 2013, a good calorie breakfast indicated the fulfillment of the body's needs for nutrients. The availability of



calories obtained is useful for functioning the body's physiological processes, especially the brain, to carry out metabolic processes and produce ATP so that the brain works optimally. Having proper breakfast habitually will increase arousal and concentration ability (6).

A good breakfast is always done in the morning, not before lunch, and there is no need to distinguish between work/school days and holidays (3). Different experts have different definitions. Wilson et al. 2006 in New Zealand and Smith et al. in 2010 Australia set breakfast time between 6 to 9 a.m. In comparison, Barton et al. 2005 and Affenito et al. 2005 in America set breakfast at 5 to 10 o'clock on school days and 5 to 11 o'clock on holidays. The last breakfast limit is not appropriate because 10 o'clock is morning tea or morning snack (2).

Objectively, this study found significant differences in the ability of attention and concentration between students who had breakfast and students who did not eat breakfast (using MoCA-Ina). This was in accordance with Muchtar's 2008 study showing the correlation

between breakfast and snacks with concentration ability. This study found that the group of teenagers who had breakfast had an average score of concentration skills using the digit symbol test and digit span test method at 08.30 .m.a.m. was higher than the group of teenagers who did not have breakfast. Based on the results of the analysis, it was shown that the concentration ability of adolescents would be better if they ate breakfast before going to school and they ate snacks during breaks rather than those who did not have breakfast but ate snacks or those who had breakfast but did not eat snacks (7).

Neurocognitive examination, such as in MMSE, MoCA-Ina was held in a quiet room/atmosphere because it requires high concentration and attention (4). Factors that might affect this research were the narrow room and the noise from other respondents that could disrupt concentration, fatigue after receiving lessons, the level of interest for the research, and so on.

This study had several limitations. Attention test only used *digits forwards and backward*, and *serial seven*, and the assessment in the

attention section was only carried out at 10 a.m. in the first break. Other MoCA-Ina assessments, such as language, memory, visuospatial, executive function, were not performed.

## CONCLUSION

Objectively, there was a significant difference in the ability of attention and concentration based on the MoCA-Ina assessment between groups of students who had breakfast and those who did not. Students who ate breakfast had higher attention and concentration than students who did not eat breakfast. This indicated that breakfast meant incorporating adequate intake of nutrients to support students' attention and concentration, which was assessed objectively, using the MoCA-Ina assessment. In particular, breakfast is important to meet the nutritional needs in the morning, as part of fulfilling balanced and beneficial nutrition to work and study well, one of which is for attention and concentration in studying.

There was a significant difference in concentration (subjectively) between students who had breakfast and those who did not.

Students who did not eat breakfast had the symptoms of decreased concentration (subjectively) more than students who ate breakfast. It is recommended to research with more samples, more than one school institution and more complete data sources. In conducting research, it is important to pay attention to the room when conducting the MoCA-Ina assessment. A wider room is needed, or consider preparing one special room for one respondent and one tester to minimize noise from other respondents when conducting the MoCA-Ina assessment: *digit forwards and backward*, and *serial seven*. Further research can consider calculating breakfast energy intake by classifying intake by type (carbohydrates, fat, and protein). Further research can conduct other MoCA-Ina assessments, such as language, memory, visuospatial, executive function, so a comprehensive cognitive result can be obtained, and MoCA-Ina assessments can be conducted during the second break (12 a.m.).

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