

The Effect of Certain Types of Nourishment on the Intelligence Performance of 7th Class Students of Primary School Students

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Abstract

The purpose of this research is to observe the performance of intelligence of 7th year students by providing them with certain types of food. The research has been an experimental study and has been conducted in the autumn term of the 2007 – 2008 school years. In purpose of pre-election, in Erzurum İlica Şeker Primary school in classes 7/ A-B, 47 and in Erzurum İstiklal Primary school in classes 7/ A-C 33 students were given the R. B. Catel Intelligence Test and Personal Information Forms were applied to them. Following this, 20 students were chosen as the experimental group and 20 students were chosen as the control group. The experimental group has been provided to take certain types of nourishment for 8 weeks “regularly and under control”. The control group has been provided to take these kinds of nourishment in minimum amount. In the research, the data related to the students’ development of intelligence were added to the Cattell Intelligence Test, which was developed by Cattell (1957) and adopted by Toğrol (1974). The raw points obtained from this process were turned into points related to “parts of intelligence”. In order to analyse whether the difference between the averages of pre-test points and post-test points were meaningful t test has been done; in order to analyse the relation between the averages of pre-test and post-test correlation analysis has been performed. At the end of the research following findings were observed. In terms of gender, there hasn’t been any meaningful differentiation observed between the averages of the pre-test and post-test points related to parts of intelligence of girls and boys. In terms of being a private school or state school, there hasn’t been any meaningful differentiation observed between the averages of the pre-test and post-test points related to parts of intelligence. It is observed that there hasn’t been any meaningful differentiation in the averages of pre-test points related to parts of intelligence between the experimental group and the control group. However, there has been a meaningful differentiation observed in the averages of post-test points related to parts of intelligence of the experimental group. There has been a positive and very meaningful relation between the averages of pre- test and post- test points.

Key Words: Nourishment and mental performance

Introduction

Nourishment is explained as a environmental factor particularly affecting the mental development. (Düzgün, 2002; Yeşilyaprak, Aydın, Can, Ersanlı, Kılıç, Külahoğlu, Öztürk,

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Bilge, Küçükkaragöz, Kısaç, Korkmaz & Bilgin, 2005; Wainwright & Colombo, 2006; Kaya, Baş, Çakır, Çırak, Çiftçi, Duy, Elyas, Gündoğdu, Kabasakal, Karahan, Kaygusuz, Oral, Özcan, Özyurt, Sardoğan, Savaş, Siyez, Taylı, Üstün & Yöndem, 2007; Akbaba, Anlıak, Uşun, Karçkay, Şahin, Bozkurt, Karaca, Aydın, Murat, Koç, Sargın, Aydın, Yapıcı, Özben & Karacık, 2007; Ulusoy, Güngör, Akyol, Subaşı, Ünver & Koç, 2007; Bacanlı, 2007; İnanç, Bilgin & Atıcı, 2007; Yıldırım, Akbaba, Öztürk, Özer, Oral, Yurtal, Keklik, Değer, Yapıcı, Yılmaz, Sargın, Kararımak, Zeren & Sahranç, 2008). Malnutrition, particularly in babyhood & childhood, causes a decrease in mental processes (Daniels & Adair, 2005; Wachs, 2005; Webb, Horton & Katz, 2005; Rodekamp, Harder, Kohlhoff, Dudenhausen, & Plagemann, 2006; Subasinghe & Wijesinghe, 2006; Clark, Castillo, Calatroni, Walter, Cayazzo, Pino & Lozoff, 2006; Silva, Mehta & O'Callaghan, 2006). There are scientific findings that the support of the vitamin A found particularly in carrot, spinach, pumpkin, lettuce, broccoli, liver and tomato; and the support of the vitamin B found in cracked wheat pilaf, oat, rye, bran bread, whole wheat bread, okra, tarhana soup, peanut, pine nut, hot pepper, Italian pepper, the leaves of celery, dill, flax seed, tahini, chicken liver, beef, fish, feta cheese, milk and egg yolk have an important role in mental development (Solon, Riddell, Quimbo, Butrick, Aylward, Bacate & Peabody, 2008). In some research, the positive contribution of iron found abundantly in molasses, raisin, meat, egg and legumes; copper found abundantly in almond, avocado, rennet, barley, beetroot, black pepper, molasses, broccoli, cocoa, garlic, grape, orange, walnut, green stuff, hazelnut, honey, lentil, liver, lobster, mushroom, oat, peanut, red beet, salmon, shrimp, sunflowers seed and soya; zinc found abundantly in oyster, cheese, meat, chocolate free from milk, cannellini bean, egg, corn, Brussels-sprout, shrimp and broccoli and magnesium found abundantly in cocoa, spinach, feta cheese, sole fish and banana; selenium found abundantly in The Brazil nut, tuna steak, shrimp, codfish, sunflowers seed, cashew hazelnut, rice, walnut, egg and chicken have a positive contribution to mental development (Katzen-Luchenta, 2007; Sachdev, Gera & Nestel, 2005; Qian, Wang, Watkins, Gebiski, Yan, Li & Chen, 2005). It has also been found that iodine deficiency affects mental development (Tang, Liu, Yin, Wang, Dong, Wang & Chen, 2007). Besides, there is a meaningful positive relation between the mental performance and obesity and overweight (Chandola, Deary, Blane & Batty, 2007). Some

scientists suggest that heredity and environment shape the intelligence (Caspi, Williams, Kim-Cohen, Craig, Milne, Poulton, Schalkwyk, Taylor, Werts & Moffitt, 2007; Pearce, Deary, Young & Parker, 2005). There are also research reports that suggest cumin and peppermint oil used in this research supports and stimulates the brain (Singh, Singh, Maurya, Singh, Dubey & Singh, 2004).

In this research, a mix of the nourishments explained above is given to the primary school students for a specific time and their effect on the students' mental development is observed. The purpose of this research is to observe the performance of intelligence of 7th year students by providing them with certain types of food in terms of variables such as gender and school type. The research results studying particularly the relations between nutrients and intelligence being limited makes this research dealing with this special subject not much studied notable. The data collected through the study is beyond supplementing the existing results. The purpose of the study is to point out the importance of the nutrients in educational process. Moreover, studying the individual as bio-psycho- social in holistic perspective and examining a sophisticated and complicated feature like intelligence increase the value of the research which will guide to future researches.

Method

In this section, the used research pattern, determining the experimental group and control group, the procedures applied on experimental and control groups, data collection tools, data collection process, data analyse techniques and limitations of the research are explained.

Research Pattern

Pre-test and post-test with control group experimental pattern is used for the purpose of the research. Experimental patterns are the research patterns which aim to explore the cause and effect relations between the variables. In this pattern, the groups which are

examined are split into two groups. At the beginning of the research pre-test is applied and at the end of the research post-test is applied to these groups and results are concluded by looking through the differences between them (Creswell, 2003 ; Ekiz, 2003).

Determining Control and Experimental Groups

Actual sample of the research is formed with 47 students in 7 / A-B classes from Ilıca Şeker Primary School and to 33 students in 7 B-D from Erzurum Private İstiklal Primary School. 'Group mapping' technique is used to determine the study groups. In this technique, two groups are determined with regard to the group averages which belong to the relevant variables (Büyüköztürk, 2001). In this sense, at the beginning of the study, the groups are divided into two groups as control and experimental group. In the process of determining the control and experimental groups, Cattell Intelligence Test (pre-test) is applied to the groups. Then, the results related to the intelligence points obtained from control and experimental groups are inserted to SPSS program and 't' test is applied to the independent groups. With the results of the analysis conducted, it has been seen that there is not a meaningful statistic differentiation between the groups. The table concerned with these results can be seen below.

Table 1. The t test values related to pre-test points of experimental and control group

| Pre-test | N | M | SD | t | p |
|--------------|----|--------|-------|-------|------|
| Experimental | 19 | 149.62 | 35.98 | 0.851 | .400 |
| Control | 21 | 140.48 | 31.97 | | |

On the table examined, there is not a meaningful difference between the control and experimental groups according to pre-test results and it is seen that the groups are similar to each other ($t_{38} = 0.851, p = .400$).

The Procedures Applied to Experimental Group

Diet program. The diet program based on current literature which is prepared by researchers is given to the students for eight week as seen below:

1. Students are made to start the day with natural nourishments such as a teaspoon of honey, a teaspoon of molasses, a handful of raisin, 3-4 figs, 3-4 apricots or date fruits, which contain glucose, collaborating with parents.
2. Students are made to eat rosehip marmalade each day collaborating with parents.
3. Students are made to add cumin to their dish in each meal collaborating with parents.
4. Students are made to smell peppermint oil five or six times a day collaborating with parents.

The Procedures Applied to Control Group

No special practice is made about nourishment; it is made to take the nourishments above at a minimum level by collaborating with parents.

Data Collection Tools

Cattell Intelligence Test 2A-2B. Cattell Intelligence test was developed by Cattell (1957) and adaptation works are done by Toğrol (1974). Test is used for intelligence measurement in individuals whose age is between 7-6 or 14-20. Cattell Intelligence Test is applied in twenty five minutes. It consists of four sections and the application time of each section is different. There are separate explanations and examples for each section. Explanations are verbally made. The test can be applied on either individuals or groups. Grading the test is made according to the answer key. Each correct answer is '1' point. The total point obtained from the test shows the mental age of the individual. Intelligence section of the individual is estimated with the 'mental age/chronological age x 100' formula. No special education is needed to apply the test.

Reliability

Two-half-test reliability. In a number of studies, reliability factor of the test estimated with the two half-test reliability is averagely 0.80.

Parallel form reliability. Correlation factor of the test between 2A and 2B Forms is found above 0.50.

Validity

Criterion-dependent validity. The correlation between Porteus Labyrinth Test and Cattell Intelligence Test applied to 1300 children is below 0.50. The test has criterion-dependent validity (Öner, 1997).

Data Collection Process

In this paper, as explained before, data is collected depending on the experimental pattern. It has been noted that the obtained data facilitates to compare the results of the control and experimental groups and to help see the effects of nourishments on mental performance of the students. In this sense, it is studied that deep, intense, rich and explaining data appeared in the process is obtained.

First, equalized 20 children for experimental group and 20 children for control group are chosen by applying Cattell Intelligence Test on 80 students from both schools. Then experimental group is made to be given certain types of nourishments regularly. At the end of eight week, Cattell Intelligence Test is re-applied for post-test, the obtained data is prepared to analyse considering variables such as gender, school type.

Data Analysis Techniques

The data obtained through the research is inserted into the SPSS 16.0 statistic program and it is analysed. Different statistical techniques are used in analysing the obtained data.

First of all, Independent Samples T-Test technique is used to determine if there is a meaningful differentiation in the pre-test scores of the experimental group and control group. Two-way ANOVA for Mixed Measures technique is used to see simultaneously the variant differentiations between the groups to test if there is a meaningful differentiation in point average of pre-test and post-test according to gender, school type, control group and experimental group. Besides, Pearson Moments Correlation Technique is used to determine if there is a relation between the point average of pre-test and post-test.

The Constraints of the Research

The research has some constraints. These are:

The findings of this research are limited to the primary school students in the study groups; the effort and intimacy of the supporting teachers and parents to apply the diet program on the children participated in control and experimental groups; the ingredients of the diet program used in this research; data related to the IQ points measured with Cattell Intelligence Test which is used as the data collecting tool in the research.

Findings

Students' pre-test and post-test average points and standard deviation values obtained from the intelligence test according to their gender are indicated in Table 2.

Table 2. Standard deviation values and averages of students' pre-test and post-test according to gender

| Groups | Pre-test | | | Post-test | | |
|-----------------|----------|--------|------|-----------|--------|------|
| | N | M | SD | N | M | SD |
| Male students | 20 | 143.93 | 3.51 | 20 | 157.14 | 5.14 |
| Female Students | 20 | 145.71 | 3.32 | 20 | 154.64 | 4.34 |
| Total | 40 | 144.82 | 3.38 | 40 | 155.89 | 4.70 |

As seen in Table 2, the male students' average points from the intelligence test are 143.93 before the experiment, and they are 157.14 after the experiment. The female students' average points from the intelligence test are 145.71 before the experiment, and they are 154.64 after the experiment. In total, the average points from the intelligence test are 144.82 before the experiment, and they are 155.89 after the experiment.

The multiple comparison of students' pre-test and post-test average points obtained from the intelligence test according to gender is indicated in Table 3.

Table 3. The ANOVA table of the averages of students' pre-test and post-test from the intelligence test according to gender

| Gender | Source of | Sum of | | Mean Square | F | P |
|-----------------------|----------------|-----------|------|-------------|-------|------|
| | Variation | Squares | f.d. | | | |
| Pre-test (Gender) | Between Groups | 31.888 | 1 | 31.888 | 0.027 | .870 |
| | Within Groups | 44558.673 | 38 | 1172.597 | | |
| | Total | 44590.561 | 39 | | | |
| Post-test (Gender) | Between Groups | 62.500 | 1 | 62.500 | 0.028 | .869 |
| | Within Groups | 86150.510 | 38 | 2267.119 | | |
| | Total | 86213.010 | 39 | | | |

There is not a meaningful differentiation between the average points of the students' pre-test and post-test according to their gender ($F_{(1,38)}=0.027$, $p=.870$ and $F(1, 38)=0.028$, $p=.869$). This result shows that there is not a meaningful differentiation between the mental performance points according to gender.

Students' pre-test and post-test average points and standard deviation values obtained from the intelligence test according to the school type in which the students are educated are indicated in Table 4.

Table 4. Students' pre-test and post-test average points and standard deviation values obtained from the intelligence test according to the school type in which the students are educated

| Groups | Pre-test | | | Post-test | | |
|----------------|----------|--------|------|-----------|--------|------|
| | N | M | SD | N | M | SD |
| State School | 20 | 136.43 | 2.72 | 20 | 148.21 | 4.25 |
| Private School | 20 | 153.21 | 3.81 | 20 | 163.57 | 5.09 |
| Total | 40 | 144.82 | 3.38 | 40 | 155.89 | 4.70 |

As seen in Table 4, average points of the students who are educated in state schools from the intelligence test are 136.43 before the experiment, and they are 148.21 after the experiment. Average points of the students who are educated in private schools from the intelligence test are 153.21 before the experiment, and they are 163.57 after the experiment. In total, the average points from the intelligence test are 144.82 before the experiment, and they are 155.89 after the experiment.

The multiple comparison of students' pre-test and post-test average points obtained from the intelligence test according to the school type in which the students are educated is indicated in Table 5.

Table 5. The ANOVA table of students' pre-test and post-test average points obtained from the intelligence test according to the school type in which the students are educated

| School Type | Source of Variation | Sum of Squares | f.d. | Mean Square | F | p |
|----------------------------|---------------------|----------------|------|-------------|-------|------|
| Pre-test (School Type) | Between Groups | 2817.602 | 1 | 2817.602 | 2.563 | .118 |
| | Within Groups | 41772.959 | 38 | 1099.288 | | |
| | Total | 44590.561 | 39 | | | |
| Post-test (School Type) | Between Groups | 2358.418 | 1 | 2358.418 | 1.069 | .308 |
| | Within Groups | 83854.592 | 38 | 2206.700 | | |
| | Total | 86213.010 | 39 | | | |

As seen in Table 5, there is not a meaningful differentiation in the average points of the students' pre-test according to the school type ($F_{(1,38)}=2.563$ $p=.118$ and $F_{(1,38)}=1.069$, $p=.308$). This result shows that there is not a meaningful differentiation in mental performance points in terms of studying at a private or state school.

Pre-test and post-test average points and standard deviation values of experimental group and control group obtained from the intelligence test are indicated in Table 6.

Table 6. Averages of pre-test and post-test points and standard deviation values of experimental group and control group obtained from the intelligence test

| Groups | Pre-test | | | Post-test | | |
|--------------------|----------|--------|------|-----------|--------|------|
| | N | M | SD | N | M | SD |
| Experimental Group | 19 | 149.62 | 3.59 | 19 | 175.94 | 4.86 |
| Control Group | 21 | 140.48 | 3.19 | 21 | 137.76 | 3.80 |
| Total | 40 | 144.82 | 3.38 | 40 | 155.89 | 4.70 |

As seen in Table 6, the average points of the experimental group from the intelligence test are 137.50 before the experiment, and they are 178.21 after the experiment. The average points of the control group from the intelligence test are 133.21 before the experiment, and they are 137.14 after the experiment. In total, the average points from the intelligence test are 137.32 before the experiment, and they are 155.71 after the experiment.

The multiple comparison of pre-test and post-test average points of the experimental group and control group obtained from the intelligence test is indicated in Table 7.

Table 7. The ANOVA table of pre-test and post-test average points of the experimental group and control group obtained from the intelligence test

| | Source of | Sum of | Mean | F | p |
|--|----------------|-----------|------|-----------|---------------|
| | Variation | Squares | f.d. | | |
| Pre-test (Experimental-Control Group) | Between Groups | 834.743 | 1 | 834.743 | 0.725 .400 |
| | Within Groups | 43755.818 | 38 | 1151.469 | |
| | Total | 44590.561 | 39 | | |
| Post-test (Experimental-Control Group) | Between Groups | 14544.298 | 1 | 14544.298 | 7.712 .008 |
| | Within Groups | 71668.713 | 38 | 1886.019 | |
| | Total | 86213.010 | 39 | | |

There is not a meaningful differentiation in the average points of the experimental group and control group ($F_{(1,38)}=0,725$ $p=.400$). As expected, there is a meaningful differentiation in the average points of the students' post-test in favour of the experimental group ($F_{(1,38)}=7,712$, $p=.008$).

Correlation (r) analysis is applied to determine if there is a general relation between the pre-test points and post-test points and the results are indicated in Table 8.

Table 8. The correlation (r) value related to the relation between the averages of pre-test and post-test points

| | | Post-test | p |
|----------|-------------------------|-----------|------|
| Pre-test | Pearson Correlation (r) | .77 | .000 |
| | N | 40 | |

There is a meaningful differentiation between the pre-test and post-test average points in positive way ($r = 0.77$, $p = .000$). This result proves that there is a balance in the development of students and students' current readiness level in terms of mental exercise.

Discussion and Conclusions

It is seen that, according to their gender, there is not a meaningful differentiation between the pre-test and post-test average points of the male and female students related to their mental performance. According to students' being educated in state or private schools, there is not a meaningful differentiation in the average points of the pre-test and post-test related to students' mental performances. There is not a meaningful differentiation between pre-test average points of control group and experimental group while there is a meaningful differentiation in post-test average points related to mental performances in favour of experimental group. This result can be explained with the positive effect of the diet program applied to experimental group on the mental performance points of the students. There are research results which support this result in literature In their research, Steinmacher, Pohlandt, Bode, Sander, Kron & Franz, (2007) have found that there

is a relation between iron deficiency and mental performance. Removing this deficiency with nutrients and serums has a positive effect on mental performance. Gonzalez, Malpeli, Etchegoyen, Lucero, Romero, Lagunas, Lailhacar, Olivares & Uauy, (2007) have found that amnesia and attention disorder emerge in children because of malnutrition and malnutrition affects the academic success negatively. Isaacs, Gadian, Sabatini, Chong, Quinn, Fischl, & Lucas, (2008) have found that dietary specialization in youth has a significant effect on brain function and structure.. There is a meaningful relation in a positive way between the pre-test and post-test average points. According to these results, eating activities at home and in schools can be maintained in a way based on the nourishments mentioned in this paper. For further research, other variables which affect the mental performance can be added to be analysed. Lectures about the effect of the nourishment on mental performance can be given to the parents and teachers.

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