

Efficacy Of Nutritional Intervention, Parental Supports And Academic Self-Concepts On Pupils' Academic Achievement Sustainability In Atiba Local Government Area Of Oyo State, Nigeria

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ABSTRACT

This study determined the efficacy of nutritional intervention, parental supports and academic self-concepts on pupils' academic achievement in Atiba Local Government Area of Oyo State, Nigeria. The study adopted ex-post-facto and pretest, posttest, control group quasi experimental design, 2 x 2 x 2 factorial matrix with 110 pupils participants in the study (Experimental = 60; control = 50). Four validated instruments, Pupils' Academic Achievement Test ($r=.87$), Pupils Parental Supports Scale ($r=.79$), Pupils' Academic Self-concepts Scale ($r=.81$) and Pupils' Nutritional Intervention Guide ($r=.73$). Data were analysed using regression analysis and Analysis of Covariance. The participants were 43.64% male and 56.36% female; 30% passive parental supports and 70% active parental supports; 30.91% low academic self-concepts and 69.09% high academic self-concepts. Treatment had significant main effect on pupils' academic achievement ($F_{(1,101)} = 28.268$; $\eta^2=.219$). Participants in nutritional intervention group ($\bar{x} = 27.583$) had better achievement compared to those in control ($\bar{x} = 24.980$). Parental supports had significant main effect on achievement ($F_{(1,101)} = 8.600$; $\eta^2 = .077$). Pupils with active parental support had better achievement ($\bar{x} = 27.740$) than those with passive parental support ($\bar{x} = 22.316$). Academic self concepts had significant main effect on achievement ($F_{(1,101)} = 5.278$; $\eta^2 = .089$). Participants with high academic self-concepts had better achievement ($\bar{x} = 28.726$) than those with low academic self-concept ($\bar{x} = 23.667$). The nutritional intervention enhanced pupils' academic achievement in primary schools. It sustained better pupils' knowledge acquisition in schools. Therefore, government should implement nutritional intervention in schools to improve learning outcomes in primary schools irrespective of pupils' parental supports and academic self-concepts.

Keywords: Nutritional Intervention, Parental Supports, Academic Self-Concepts, Pupils Academic Achievement, Atiba Local Government Area Of Oyo State.

INTRODUCTION

Children's diet has deteriorated tremendously over the last decades, and has become a major source of preoccupation in developed countries, in particular in view of the rising rates of obesity among young children, observed across almost all developed and developing countries. According to the World Health Organization (2010), nutrition is related to five of the ten leading risks as causes of disease burden measured in DALYs (Disability Adjusted Life Years) in the world i.e. high blood pressure, cholesterol, overweight (obesity) and iron deficiency. Importantly, children's poor diet does not only have direct negative effects on their weight and health, but also results in significant deficiencies in those nutrients playing an essential role in cognitive development (Lambert, Agostoni, Elmadfa, Hulsof, Krause, Livingstone, Socha, Pannemans & Samartins, 2004).

Good nutrition is important to supporting growth and maximizing learning potentials. Due to current research, Nigerians are becoming increasingly educated on the role nutrition plays on the body's and mind's ability to grow and the performance of our potential learning capacity. Nutritional intake affects energy levels, physical stamina, mood, memory, mental clarity, and emotional and mental well-being. Research have proven that good nutrition is pertinent for the brain, so the old adage, "You are what you eat" is proving to be true. Parents and educators need to educate today's youth to make healthier food choices because they are being raised in a culture of fast food (Meyer, 2005). A study should therefore be conducted in a school setting to show the direct impact of meeting the recommended daily allowance (RDA) of various food groups such as fruits, vegetables, meat, and grains on the effects of

cognitive function and academic performance in Oyo state and the entire Nigeria. A number of studies point at the significant and *immediate* effect of diet on behaviour, concentration and cognitive ability; as well as on the immune system, and therefore the ability to attend school (Wolf, Burkman & Streng, 2000; Kar, Rao, & Chandramouli, 2008; Lahey & Rosen, 2010; Paul & Mondal, 2012; Rausch, 2013).

Rausch (2013) analyzed multiple articles that demonstrate the effects of poor nutrition on school-age children. The research showed that having a healthy, balanced diet improves – brain capacity, maximizes cognitive capabilities, and improves academic performance in school-age children. Alternatively, the research also shows that having too much junk food and an unhealthy diet decreases academic performance by limiting the amount of information to the brain. The brain is able to both retain and recall on demand adequate information when fed with right quantity and quality of meal. The literature also shows the danger of not having enough nutrition and the effects of food insufficiency, which can lead to malnutrition as well as poor academic performance.

Paul and Mondal (2012) analyzed the nature and impact of mid-day meal programme on academic achievement of pupils in some selected upper primary level schools of Burdwan district in West Bengal. The study covers three hundred pupils (N = 300) both in urban and rural areas encompassing “Below Poverty Line” (BPL) and “Above Poverty Line” (APL). The results of Chi-square-test revealed that mid-day meal program has had a significant positive impact on academic achievement of pupils.

Wolfe, Burkman and Streng (2000) began by creating an equation:

good nutrition + exercise = optimal learning. They supported the following questions with research:

1. How does breakfast help kids do better in the classroom?
2. Can certain foods enhance a child’s learning or memory?
3. Do supplements help children perform better in the classroom?

Wolfe, Burkman and Streng cited research confirmed that proper nutritional support is important to allow the brain to function at its highest ability and to enhance learning. Wolf and Burkman suggested that it didn’t take much complication or obscurity through expensive foods and supplements to help students reach their potentials; healthful nutritional habits learned early in life help endure normal physiological and neurological growth and development, which translated into students’ achieving optimal learning, defined as the abilities to recall information, to problem solve, and to think

critically. Wolfe, Burkman and Streng pointed out the importance of utilizing the Food Guide Pyramid for Young Children, which is an adaptation of the Food Guide Pyramid from the U.S. Department of Food and Agriculture. This food guide focuses on food preferences and nutritional requirements of young children and needs to be the foundation of their diets (Wolf & Burkman, 2000).

Earlier, Wolfe, Burkman and Streng (2000) stated that several dietary components support brain function and neurotransmitter activity, and that scientists recommend a wide range of foods as nutrient sources; the most important of which are protein, fat, B vitamins, iron, chlorine, and antioxidants. Offering students the right food choices and helping them develop positive, healthy eating habits will support optimal functioning of the brain. Eating breakfast helps students to eliminate or reduce stomach pain, headache, muscle tension, and fatigue, all which lead to an interference with learning. School personnels have the perfect access to students’ breakfast eating habits and need to utilize the opportunity to teach students good breakfast eating habits, whether at school or home. The negative impact of skipping a meal is also highlighted by Wolfe, Burkman and Streng. Without an adequate daily intake of nutrients from food, the body puts learning on a lower shelf below its need to sustain life-support functions. Therefore, in many cases, skipping a meal negatively affected the body and its learning functions. Wolfe, Burkman and Streng concluded that as many as half of low-income elementary students skipped breakfast and that children who eat a good breakfast at school perform better on standardized tests.

Also, they found that children who eat breakfast have improved attention in late-morning performance tasks, retrieve information more quickly and accurately, make fewer errors in problem-solving activities, and concentrate better and perform more complex tasks. Also, what the child eats for breakfast is important. A breakfast comprised of protein, fat, and sugar will prevent drops in blood sugar for several hours, whereas, a breakfast of just starch and sugar will sustain a child for only about two hours. A meal that included food from several food groups was the best for a child who was expected to perform at his or her best in school, educationally and physically. Wolfe and Burkman called attention to school food programs and contend that such programs need support, not disdain. Every lunch must contain at least one-third of the Recommended Daily Allowance (RDA) for specific key nutrients, and every breakfast must contain one-fourth of the RDA for specific nutrients. School meals must conform to the U.S. Dietary Guidelines and on a weekly average, no more than thirty percent of the calories can be from fat (Wolfe, Burkman & Streng, 2000). To sum up

Wolfe and Burkman's findings, the performance possibilities of children are very dependent upon their health and well-being; minds that have been given the proper nutrition will perform better on tests and general classroom tasks.

Lahey and Rosen (2010) furthered the research that nutrition affects learning and behavior and suggested that diet can influence cognition and behavior in many ways, which include the condition of not enough nutrition or the condition of the lack of certain nutrients. About one-third of children who completed a food-habit questionnaire had inadequate fruit and vegetable intake. These students also showed poor school performance as compared to those students who had an adequate intake of fruits and vegetables (Lahey & Rosen, 2010).

Kar, Rao, and Chandramouli (2008) examined the effect of stunted growth on the nature of cognitive impairments and on the rate of cognitive development. The study investigated if malnutrition would result in a concentrated impairment and a general slowing in the rate of development of all cognitive processes or these effects could be present for some specific cognitive processes. Effects of malnutrition on cognitive processes were also looked at in relation to impairment without affecting the rate of development and its effect on the rate of development of the cognitive process itself. The participants were identified as being malnourished or adequately nourished in the age groups of five- to seven-year olds and eight- to ten-year olds. Students in the malnourished group were identified by their height (stunting) and weight (wasting) of children in the same age categories with reference to the National Center of Health Statistics (NCHS). Height for age/weight for height score less than two standard deviations from the mean were considered an indicator for moderate to severe malnutrition. Adequately nourished students were identified as children who were in or above the 50th percentile of height and weight as stated by the NCHS standards. Adequately nourished students were paired with malnourished students with respect to age and grade level. Each group had 20 participants (Kar et al., 2008). Students were tested individually in a well-controlled environment. The test they were given was the NIMHANS Neuropsychological Battery for children. It was developed for children aged five to fifteen. The battery consists of neuropsychological tests to assess motor speed, attention, executive function, visuospatial relationships, comprehension, learning, and memory. The results showed that malnutrition impaired and marred students' academic performance and attitude to schooling.

Li, Dai, Jackson, and Zhang (2008) examined the associations between academic performance, cognitive functioning, and increased BMI. They

studied a nationally representative sample of 2,519 children ages eight to sixteen years old. Each participant had completed a brief neuropsychological battery and measures of height and weight. Trained examiners administered tests in a standardized environment using uniform procedures. Body weight was measured to the nearest 0.05 kg and height was measured to the nearest 0.1 cm. BMI was calculated in kilograms per meter square and then converted to a sex and age specific BMI percentile. Each participant was then categorized to an overweight BMI, an at-risk BMI, or a normal BMI. The average age of participants was 12 and they were about equally divided in gender. Li et al. (2008) found the association between BMI, cognitive functioning, and academic performance to be noteworthy. Test scores decreased as BMI on increased. This means correct feed intake commensurate to pupils age and body mass influenced pupils learning outcomes.

Jyoti, Frongillo, and Jones (2005) studied the relationship between household food insecurity and selected aspects of children's academic, social, and physical development over a four year period that spanned from kindergarten to third grade. The selected developmental outcomes were mathematics performance, reading performance, weight, BMI, and composite social skills. Data were acquired from the Early Child Longitudinal Study – Kindergarten Cohort (ECLS – K). The sampling of students for whom full data was available at both kindergarten and third grade was 11,400. Full data were required from a scored reading or mathematics assessment and parent completion of the USDA food security module. Any fluctuations in food security over the four year span respondents were categorized into four groups: remained food secure at all times, remained food insecure at all times, transitioned from food security to food insecurity, and transitioned from food insecurity to food security. Students were given a battery of test to assess reading and mathematics ability. The results indicated a significant influence of home food security on students achievement in reading and mathematics ability.

Zhang, Hebert and Muldoon (2005) created both a cross-sectional and longitudinal study to investigate the long-term effects of food insecurity on academic performance. Weight, height, and Body Mass Index (BMI) were assessed in both kindergarten and 3rd grade, when the two studies took place. Overall, there were 11,400 pupils for whom full data was available for both kindergarten and 3rd grade. Food insufficiency was measured by the quality and quantity of food supply within the previous 12 months. In order to measure academic performance, researchers administered direct assessments of mathematics and reading skills individually and were calculated using Item Response Theory (IRT). The results of the longitudinal study showed that children

from persistently food insufficient homes showed a smaller increase in both reading and mathematics performance than their more food secure counterparts, as well as a greater increase in BMI over the three years.

Cooper, Bandelow and Nevill (2011), Wesnes, Pincock and Scholey (2012), de la Hunty, Gibson and Ashwell (2013), Balvin Frantzen, Treviño, Echon, Garcia-Dominic and Dimarco (2013) have found positive effects of breakfast on both the behavior and academic performance of pupils in schools. They realized that feeding the pupils not only increased the academic performance and attitudinal interests in schooling but enhance their concentration on school activities, participation in class discussion and longingness to learn.

A case study reported by a parent of a private primary school pupil in Oyo town that her child school every Friday, a nutritional intervention was introduced in a term consisting of bread, egg and sardines which pupil paid for. Her report showed that despite the fact that her wards always consume such delicacy at home, her child attitude to schooling on Fridays changed dramatically compared to other days of the week. Another case study is that of the O-Meal introduced in Osun State to feed the pupils in public primary schools to impact on their nutritional, cognitive and attitudinal performance of the pupils. The results indicated an upsurge in the pupils' enrolment for primary education and improved academic achievement as well as positive attitudes towards schooling.

Host of factors make or mar pupils' performance in school, among is parental supports. Parents' play an important role in their children's learning. Aside from being actively involved in their children's education, parents also provide a home environment that can affect learning. Parents serve as a model for learning, determine the educational resources available in the home and hold particular attitudes and values towards education (Panneer Selvam, 2013). "Parent involvement" "Parent participation" and "parental supports" are nebulous terms because there is an array of parent behaviors that these could include. To define parent involvement or supports more operationally, Clark (1927) theorized a two-way breakdown into home-based activities (e.g., parent home tutoring) and school based parent involvement activities (e.g., parent volunteering, attendance at parent-teacher conferences). Panneer Selvam (2013) posited that Parental supports or parent Involvement in child education can be: The traditional type of parent involvement type (the parent as audience or bystander-observer); Parents as decision makers (as in School Advisory Committees or Parent Teacher Associations [PTAs] in which parents participate in school decision making

activities); Parents begin as classroom volunteers; Parent as a paid paraprofessional or teacher's aide; Parents as learners (e.g., participate in child development or parenting classes); Parents as teachers of their own children at home. Studies have revealed that there exists a strong impact of parental supports on pupils' performance in schools (Charles & Alberto, 2003; Henderson & Berla, 2004; Panneer Selvam, 2013; Ann & Philomena, 2014).

Another factor is pupils' academic self-concept. McLeod (2008) referred to self-concept as a general term used to refer to how someone thinks about or perceives oneself, how an individual think and evaluate him or herself. Self concept, as a personality construct, has been defined as the perception on oneself (Aina, 2006). In simple terms, Self concept could be seen as a conjunction of our attitudes, feelings, and knowledge about our abilities, skills, appearance and social acceptability. It may be negative or positive self conception. While Sanchez and Roda (2003), Barker, Dowsoon and McInery (2005), Aina (2006), Dambudzo (2009), Olagunju, Duyilemi and Adesina (2013), concluded that a moderately strong concurrent relationship exists between learners' academic achievement and their academic self concept. Trusty, Watts and House (1996), Areepathemanol and Freeman (2008) did not account for a significant amount of variability in achievement test scores based on academic self concept. Thus, can the pupils' academic self concept impact their academic outcomes in primary schools as well as the interaction effects with the independent variable and parental supports? This study investigated this.

Statement of the Problem

Studies revealed that majority of children in the third world countries are malnourished and starved of nutrients which invariably mar their performance in school activities. Children in primary schools are at growing stage of life. Poor nutrition impairs their mental, social, physical and academic development. Thus, this research attempts to look at the relevance of nutrition and determine its effects on cognitive development. Parental supports in child education cannot be over-emphasized, so also the perception which the pupils made of themselves in teaching – learning environment. Therefore, two moderator variables, parental supports and pupils' academic self-concept were determined along the nutritional intervention on pupils' academic achievement in schools. It is hoped that if adequate research exists and is readily available to schools and parents, the children would have the opportunity to be as nutritionally healthy as possible for optimal brain function, cognitive development, positive social behaviours, and energy bubbling to carry out school activities. This information is lacking in Oyo state and has created a gap for the present study to

determine the main effects and interaction effects of nutrition, parental supports and pupils’ academic self-concepts on their academic achievement in schools.

Objectives of the Study

The key objectives of the study are as follows; to:

- assess the role of nutritional intervention on academic achievement of pupils.
- examine the relative effects of nutritional intervention among the pupils that experience parental supports and those not having parental supports.
- to compare the effects of nutritional intervention on pupils with high and low academic self-concepts.
- find out the interaction effects of nutritional intervention, parental supports and academic self-concepts on pupils’ academic learning outcomes.

Research Questions

1. What are the relative effects of nutritional intervention, parental supports and academic self-concepts on pupils’ academic achievement?
2. What is the composite effect of nutritional intervention, parental supports and academic self-concepts on pupils’ academic achievement?

Hypotheses

- Ho 1: There is no significant main effect of nutritional intervention on pupils’ academic achievement;
- Ho 2: There is no significant main effect of parental supports on pupils’ academic achievement;
- Ho 3: There is no significant main effect of academic self-concepts on pupils’ academic achievement;
- Ho 4: There is no significant interaction effect of nutritional intervention and parental supports on pupils’ academic achievement.
- Ho 5: There is no significant interaction effect of nutritional intervention and academic self-concepts on pupils’ academic achievement.
- Ho 6: There is no significant interaction effect of parental supports and academic self-concepts on pupils’ academic achievement.
- Ho 7: There is no significant interaction effect of nutritional intervention, parental supports and academic self-concepts on pupils’ academic achievement.

Methodology

Research Design

The designs for the study are ex-post-facto and pre-test, post-test, control group quasi experimental designs. It is ex-post-facto because the moderator variables to measure are already available in the field which needs no manipulation. It is equally quasi-experimental since the independent variable; nutritional intervention is to be manipulated at two levels to determine its impacts on pupils’ learning outcome.

The research design is diagrammatically represented below using symbols:

O ₁	X ₁	O ₃	E	Experimental group
O ₂	X ₂	O ₄	C	Control group

Where:

- O₁, O₂ = Pre-test Scores of the Experimental and Control groups;
- O₃, O₄ = Post-test Scores of the Experimental and Control groups;
- E = the Experimental group;
- C = Control group;
- X₁ represents Nutritional intervention
- X₂ Non-nutritional intervention group

The factorial pattern which shows treatment at two levels (one experimental and one control), parental supports at two levels (Active Parental Supports and Passive Parental Supports), and pupils’ academic self concepts at two levels (High and Low) is shown in Table 1.

Table 1: Factorial pattern of nutritional intervention, parental supports and academic self-concepts.

Treatment	Academic Self-concept		Parental Supports
Nutritional intervention group	Negative	Positive	Active
Non- nutritional intervention group (Control group)			Passive

Selection of Participants

The target population for the study consisted of all primary four pupils in public schools in Atiba Local Government Area of Oyo State, Nigeria. The first stage of the selection procedure was the compilation of all the public primary schools in the study area. Simple random sampling technique was used to select two schools into the experimental group and another different two schools into control group. Intact classes of primary four were used for the study.

Instrumentation

Four research instruments were used to collect data from the subject (pupils) of the study. The instruments are:

- i. Pupils' Academic Achievement Test (PAAT);
- ii. Pupils Parental Supports Scale (PPSS);
- iii. Pupils Academic Self-concept Scale (PASCs) and
- iv. Pupils' Nutritional Intervention Guide (PNIG)

The response instrument Pupils Academic Achievement Test (PAAT) comprises of ten objective questions each on the four core subjects – Mathematics; English Studies, Social Studies and Basic Science totaling forty (40) objective questions. The initial one hundred and twenty (120) items objective test was validated by psychometricians and difficulty level of each item was conducted, forty (40) items with an average item difficulty value of 0.51 Survived the instrument validity. The validated PAAT was administered on thirty-five pupils in Oyo East Local Government Area of Oyo State. Kuder-Richardson-20 (KR-20) was used to measure the reliability given an index of 0.87 signaling that the instrument was both valid and reliable.

The Pupils Parental Support Scale (PPSS) has twenty (20) items to measure the pupils' extent of parental supports. The initial forty items was validated by experts in Guidance and Counselling for content and face validity. Twenty (20) items selected was subjected to Cronbach's Alpha reliability measure yielding an index of 0.79

The Pupils Academic Self-concept Scale (PASCs) is a 20 item instrument adopted from Liu and Wang's Academic Self-concept Scale (2005). It is a Likert type of instrument with two sections. Section A sought information from the respondents in terms of pupil's school name, gender, date of birth, local government area, number of children in the family. Section B consists of 20 items covering the statements reflecting the student's academic self-concept. The respondents were to indicate the extent of their agreement with each statement by choosing one of the four possible responses which are:

Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). The items were scored based on the weight assigned to each of them on whether the statement is positively or negatively worded. Positive statements were scored as follows: Strongly Agreed – 4, Agreed - 3, Disagreed - 2, Strongly Disagreed -1. The negatively worded statements were scored in reverse order. The initial 20 item instrument was given to experts in Guidance and Counselling for review in terms of content, relevance, scope of coverage, language of presentation, clarity of expression and overall adequacy. Based on their comments, some of the items were modified and the 20 items survived the experts' scrutiny. The twenty item instrument was then administered to Thirty (30) pupils outside the sample. The reliability coefficient of the instrument was calculated using Cronbach's Alpha measure. The instrument yielded a reliability index of 0.81 which indicates that it is highly reliable.

The pupils' Nutritional Intervention Guide (PNIG) was designed by the researchers with experts from Food and Nutrition. The guide (PNIG) was administered on two nutritionists, their assessment scores were subjected to inter-rater reliability yielding an index of 0.73.

Treatment and procedure for data collection

The treatments comprised the nutritional intervention that was made available to the primary four pupils in the morning (Breakfast) and afternoon (Lunch) while the control group did not have any nutritional intervention.

The test instruments (PPSS, PASCs and PAAT) were administered as pretest before the treatment commences and immediately after the treatment, the instrument (PAAT) was administered again on the same intact pupils as posttests.

Method of data analysis

The data were analyzed using frequency counts and percentages to present the social demographic variables of the respondents, regression analysis to answer the research questions and Analysis of Covariance (ANCOVA) with the pre-test scores as covariates to test the hypotheses. Analysis of Co-Variance was used to single out the initial group differences. Also, the Estimated Marginal Mean (EMM) of the ANCOVA was used to detect the magnitude and direction of differences.

RESULTS

Table 2: Socio-demographic attributes of the respondents

Attributes	Frequency	Percentages
Gender		
Male	48	43.64%
Female	62	56.36%
Total	110	100.0
Parental Supports		
Passive	33	30.0%
Active	77	70.0%
Total	110	100.0
Academic Self-concepts		
Low	34	30.91%
High	76	69.09%
Total	110	100.0

From Table 2, forty-eight (43.64%) of the respondents were male while sixty-two (56.36%) were female. Thirty-three (30%) have passive parental supports while seventy-seven (70%) experienced active parental supports. Thirty-four (30.91%) have low academic self-concept while the larger percentage 76 (69.09%) had high academic self-concept. Precisely, there were more female, more students of high parental supports and academic self-concepts than male, students with low parental supports and low academic self-concepts.

Answers to Research Questions

Research question one: What are the relative effects of nutritional intervention, parental supports and academic self-concepts on pupils’ academic achievement?

Table 3: Regression analysis on relative effects of nutritional intervention and parental supports on pupils’ academic achievement

Model	Unstandardised coefficient		Standard coefficient	T	Sig
	B	Std. Error			
(Constant)	16.642	1.695		0.917	.000
Treatment groups	.057	.032	.182	2.772	.048
Parental supports	.097	.033	.306	2.979	.004
Academic self-concepts	.073	.029	.294	2.827	.027

a. Dependent Variable: academic_achievement

Table 3 indicated that the relative effect of the treatment (nutritional intervention) on the pupils’ academic achievement is significant (B = .182, t= 2.77, p< .05); the effect of parental supports on pupils’ academic achievement is significant (B = .306, t= 2.98, p< .05); also, the effect of academic

self-concepts on pupils’ academic achievement is significant (B = .294, t= 2.83, p< .05).

Research question two: What is the composite effect of nutritional intervention, parental supports and academic self-concepts on pupils’ academic achievement?

Table 4: Regression analysis on composite effects of nutritional intervention, parental supports and academic self-concepts on pupils’ academic achievement

Model	R	R Square	Adjusted R Square	Error of the Estimate
1	.430	.185	.170	3.309
	Sum of Squares	df	Mean Square	F
Regression	265.82	2	132.91	12.13
Residual	1171.498	107	10.949	
Total	1437.318	109		

From Table 4, the composite effect of nutritional intervention, parental supports and academic self-concepts on pupils’ academic achievement is significant (F (2, 107) = 12.13; R= .430; R² = .185). The trio factors contributed 18.5 % to the variance in the pupils’ academic achievement in schools.

Hypotheses Testing

Ho 1: “There is no significant main effect of nutritional intervention on pupils’ academic achievement”.

Table 5.1: Summary of analysis of covariance of effect of nutritional intervention, parental supports and academic self-concepts on pupils’ academic achievement.

Dependent Variable: academic achievement

Source	Type III Sum of Squares	df	Mean Square	F	Sig	Partial Eta Square
Corrected Model	2169.697 ^a	8	271.212	15.994	.000	.559
Intercept	558.412	1	558.412	32.930	.000	.246
Pre_ach_scores	564.650	1	564.650	33.298	.000	.248
Treatment-groups	479.353	1	479.353	28.268	.000	.219
Parental_supportra	107.549	1	107.549	6.342	.043	.093
Aca_self-concenpra	89.496	1	89.496	5.278	.039	.089
Treatment_groups*	4.209	1	4.209	.248	.619	.002
Aca_self-concentra						
Parental_supportra	6.340	1	6.340	.374	.542	.004
Aca_self-concentra						
Parental_supportra*	18.009	1	18.009	1.062	.305	.010
Aca_self-concentra						
Treatment_groups*	.616	1	.616	.036	.849	.000
Parental_supportra*						
Aca_self-concepra						
Error	1712.703	101	16.957			
Total	80548.000	110				
Corrected Total	3882.400	109				

R squared = .597 adjusted R-squared = .462)

From table 5.1, the effect of the treatment (nutritional intervention) on pupils academic achievement was significant ($F_{(1,101)}=28.268;p<.05;\eta^2=.219$). Therefore, Ho 1 was not accepted. To determine the magnitude

and direction of the effect of the significant difference, the Estimated Marginal Mean of the treatment groups were analysed and presented in Table 5.2..

Table 5.2: Estimated marginal mean of the effect of treatment, parental supports and academic self-concepts on pupils’ academic achievement

Variables	N	Mean	Std. Deviation
Intercept			
Pre-achievement	110	18.610	
Post-achievement	110	26.581	
Treatments			
Experimental	60	27.583	7.05
Control	50	24.980	11.21
Parental supports			
Active	77	27.74	6.29
Passive	33	23.27	13.44
Academic self-concepts			
High			
Low	76	27.96	3.86
	34	22.91	8.09

Table 5.2 revealed that those pupils on nutritional intervention had higher academic achievement (27.583) than those in the control (24.980).

Ho 2: “There is no significant main effect of parental support on pupils’ academic achievement”.

From table 5.1, the main effect of parental supports on pupils’ academic achievement was significant ($F_{(1,101)}=6.342;p<.05;\eta^2=.093$). Therefore, Ho 2 was

not accepted. Table 5.2 revealed that pupils with active parental supports had higher academic achievement (27.74) than their passive parental supports counterpart (23.27).

Ho 3: “There is no significant main effect of academic self-concepts on pupils’ academic achievement”.

From table 5.1, the main effect of academic self-concepts on pupils’ academic achievement was

significant ($F_{(1,101)} = 5.278; p < .05; \eta^2 = .089$). Therefore, Ho 3 was not accepted. Table 5.2 indicated that pupils with high academic self-concepts had higher academic achievement (27.96) than their low academic self-concepts counterpart (22.91).

Ho 4: “There is no significant interaction effect of treatment and parental supports on pupils’ academic achievement”.

From table 5.1, the interaction effect of treatment and parental supports on pupils’ academic achievement was not significant ($F_{(1,101)} = .248; p > .05; \eta^2 = .002$). Therefore, Ho 4 was not rejected.

Ho 5: “There is no significant interaction effect of treatment and academic self-concepts on pupils’ academic achievement”.

From table 5.1, the interaction effect of treatment and academic self-concepts on pupils’ academic achievement was not significant ($F_{(1,101)} = .374; p > .05; \eta^2 = .004$). Therefore, Ho 5 was not rejected.

Ho 6: “There is no significant interaction effect of parental supports and academic self-concepts on pupils’ academic achievement”.

From table 5.1, the interaction effect of parental supports and academic self-concepts on pupils’ academic achievement was not significant ($F_{(1,101)} = 1.062; p > .05; \eta^2 = .010$). Therefore, Ho 6 was not rejected.

Ho 7: “There is no significant interaction effect of treatment, parental supports and academic self-concepts on pupils’ academic achievement”.

From table 5.1, the interaction effect of treatment, parental supports and academic self-concepts on pupils’ academic achievement was not significant ($F_{(1,101)} = .036; p > .05; \eta^2 = .000$). Therefore, Ho 7 was not rejected.

DISCUSSION OF THE FINDINGS

The obtained results showed significant main effects of treatment (the nutritional intervention) on the pupils’ academic achievement. These results indicated that the nutritional intervention (the breakfast and the mid-day meal) enhanced the pupils’ achievement in the experimental group than their counterparts in the control group. The pupils in the experimental group performed better by obtaining the higher mean score in the learning outcome than the conventional group.

The observed significant main effects of pupils with nutritional intervention over their counterparts in the control group can be explained on the social, physical, mental and psychological conditioning provided by the nutritional intervention. Socially, the pupils on the experimental group were adequately and better cared for, their teachers showed more concern and

interest in their welfare making the pupils to be socially stable in the class. Physically, they are more focused on the classroom activities which engendered their mental alertness, the pupils’ mind rarely wandered about owing to the satisfaction of their stomach early in the morning and at the mid-day periods. Psychologically, a well fed stomach is a satisfaction of the mind. The pupils’ mind disposition, their behaviour seemed to be highly centered on the classroom activities making them to be more psychologically stable than their counterparts in the control group.

More to that, the pupils in the experimental group were more persevering in class activities than those pupils in the control group. They are more resilient to learn, more studious, prompt in completing class works and better engaged in collaborating with others in cooperative work.

These findings agreed with the results of the study of Wolf and Burkman (2000) that several dietary components support brain function and neurotransmitter activity and that wide range of foods as nutrient sources, the most important of which are protein, fat, B vitamins, iron, chlorine and antioxidants help pupils develop positive, healthy eating habits supporting optimal functioning of the brain. It is further identified that pupils eating breakfast helps students to eliminate or reduce stomach pain, headache, muscle tension and fatigue, all which lead to an interference with learning. Also, a number of studies point at the significant and immediate effect of diet on behaviour, concentration and cognitive ability.

Similarly, the obtained results of significant effects of the nutritional intervention on pupils’ academic achievement is equally corroborated by the findings of Cooper, Bandelow and Nevil (2011), Wesnes, Pincock and Scholey (2012), Paul & Mondal, (2012), Dela Hunty, Gibson and Ashwell (2013), Balvin-Frantzea, Trevino, Echon, Garcia-Dominic and Dimerco (2013); Rausch (2013) that found positive effects of breakfast on both the behaviour and academic achievement of pupils in schools. They realized that feeding the pupils not only increased the academic performance and pupils attitudinal interests in schooling but enhance their concentration on school activities, participation in class discussion and longingness to learn.

The results of the study also revealed significant main effect of parental supports on pupils’ academic achievement. The pupils’ of high parental supports achieved better academically compared with their counterparts in the control group. As parents serve as model for learning, determine the educational resources available in the home and hold particular attitudes and values towards education. These

findings agreed with those of Charles and Alberts (2003); Henderson and Berla (2004); Panner-Selvam (2013); Ann and Philomena (2014) that parental supports hold a strong impact on pupils' performance in school.

The results of the study revealed a non-significant interaction effect of treatment (nutritional intervention), parental supports and academic self-concepts on pupils' academic achievement. This means that irrespective of the pupils' parental supports and academic self-concepts the nutritional intervention still have significant impacts on the pupils' learning outcome. This could be further explained as the strong, immediate and stimulating effects diets have on human behaviour, thinking and achievement. Really, the slogan comes into play "you are what you eat". The pupils, many for the first time in their life, taking bread and tea, garnished with egg and topped with fruits like apple, banana and sometimes fruit juice conditioned their disposition to schooling and school activities in a more positive and more appealing manner irrespective of their parental supports and academic self-concepts. These findings were corroborated by the submission of Cooper, Bandelow, and Nevill (2011); Wesnes, Pincork, and Sholey (2012); de la Hunty, Gibson and Ashwell (2013), Balvin-Frantzen, Trevino echan, Garcia-Dominic and Dimarco (2013) that breakfast have strong, uncompromising effects on pupils' learning outcomes in schools.

CONCLUSION

Based on the findings of this study, the effectiveness of nutritional intervention was established. Pupils on the experiment had higher academic achievement compared to their counterparts on the control. Thus, nutritional intervention is a sine-qua-none for improved and sustained pupils' academic achievement in schools. Further, it was identified that the pupils' parental supports and academic self-concepts were important factors in determining their academic achievement.

RECOMMENDATIONS

Based on data analysis, obtained results and discussion of findings in this study, the following recommendations were made:

1. The Federal government of Nigeria should quickly embark on the school policy of at least a meal a day for public primary schools;
2. Parents should be sensitized the more by the PTA and community supports group on their indispensable roles in enhancing and enabling pupils' academic achievement in schools;
3. Teachers in primary schools should be given regular training, workshops, seminars and lectures on enlivening and innovating their

teaching skills in order to heighten pupils' academic self-concepts.

LIMITATION OF THE STUDY

This study only focused on effects of nutritional intervention on pupils in Atiba Local Government Area of Oyo State, other pupils outside the Local Area of the study were not considered. Also, parental supports and pupils' academic self-concepts were the only moderator variables examined, other variables like pupils' self-efficacy, pupils' nutritional status, gender were not examined in the study.

CONTRIBUTIONS TO KNOWLEDGE

This study has contributed to knowledge in the following ways:

1. It has provided empirical data on the effects of nutritional intervention as an effective means of improving pupils' academic achievement in school. The result has provided the basis for the need to feed the pupils for effective and efficient learning outcomes.
2. That pupils' parental supports are invaluable ingredient to enhancement of pupils' academic achievement in school;
3. Providing empirical basis for the effects of pupils' academic self-concepts on their academic achievement.

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