THE IMPACT OF SCHOOL LUNCH PROGRAMME ON PHYSICAL, MENTAL AND BEHAVIOURAL DEVELOPMENT OF SCHOOL CHILDREN

By

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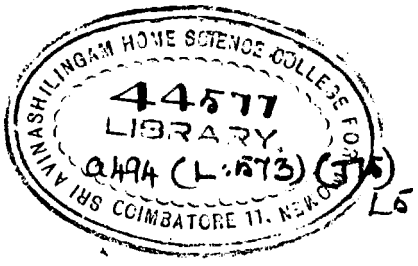

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I. INTRODUCTION

Children are the most cherished wealth of any nation. The physical and mental development of todays children determine the prosperity and peace of tomorrow, (Devadas et al 1974; WHO, 1974; Benard and Gerin, 1975). Special attention should be given by all concerned for meeting the needs and problems of the children, since damages incurred during childhood may affect irriversibly the personality of the child. Much of the development of the individual takes place during school years and nutrition during this period is of vital significance, considering the vast population in this age group (Gopalan and Vijayaraghavan,1971) and as Devadas et al (1974) points out, among the basal needs, nutrition is interrelated to all aspects of development.

Malnutrition is the state of impaired functional ability or development caused by an inadequate intake of essential nutrients or calories to provide for longterm needs (Gopalan, 1974). The recognition that malnourished children may emerge from childhood lacking the ability to reach their full genetic intellectual potential, introduces a new and perhaps frightening note into the theories of national development (Berg, 1968). It has been established without doubt today, that early severe malnutrition requiring hospitalization and rehabilitation is consistently associated with defects in physical and psychological development during early life (Gyorgy, 1964; Mitchell, 1967; Scrimshaw 1967; Cravioto, 1971; Barnes, 1971; Kymal, 1972; Goldsmith, 1972; Winter, 1973 and NIN, 1973).

The physical, chemical and physiological development of the brain and consequent behaviour in all species of higher animals evolve from the continuous interaction of genetic and numerous environmental factors. Among the later are nutritional disease, psychological learning and cultural variables. Of these, nutrition is concerned directly with providing energy and nutrients needed for cellular structures and various metabolic systems. Indirectly food may serve as a stimulus for behaviour as well as providing a basic for social interaction (Nutrition Reviews, 1973). Cravioto et al (1966) and Martin (1973) points out that from infancy, nutritional needs play an important part in personality and character development, interpersonal relationship, growth and development, and in cognition and perception. All effects should therefore be made to preserve the intellectual faculties and potential mental capacity of the children.

Paradoxically, no problem is more acute and more neglected than the problem of the Indian child. Chandra (1968) estimates that, more than 70 per cent of the children go to bed everynight without adequate satisfaction of the bare pangs of hunger. Shah et al (1971) record, 8.7 per cent of the total death in India to occur in the 5 to 14 year age group and 300 million children are victims of malnutrition (Murthy, 1971; Gupta, 1972). According to Rajagopalan (1974) the total population of school children in Tamil Nadu alone constitutes 5.8 millions. Of this 4.06 millions are classified as undernourished (II and III degree malnutrition). The percentage morbidity in school age is estimated to be 24.7 per cent a great deal of which is due to malnutrition.

Gopalan (1974) emphasizes the role of specific nutrition intervention programmes as the immediate remedies in the solution of the alarming problem of malnutrition. In the efforts to overcome nutritional deficiencies among school children, perhaps one of the most important and widely undertaken programme is the school lunch programme.

Home and school play an important role in inculcating proper education for the allround development of the personality of the child. School lunch is an effective tool to teach nutrition, help to develop food habits, social living and harmony. School lunch as Bander (1974) rightly points out should include ingredients other than just food, it should provide for nourishment, an atmosphere conducive to sociability and other behavioural changes and should be an instrument of greater allround development of children. The physical, mental and social outcomes of school feeding programmes have been evaluated by Devadas and co-workers (1964, 1964, 1967 to 74).

While much laudable efforts are underway to assess the nutritional impacts of the school lunch programme, the impact of school lunch programme on the mental and behavioural development coupled with physical growth is not well documented. The present investigation was a step to explore the possible impacts of school lunch programmes on the physical, mental and behavioural development of the children. It aims at evaluating the growth pattern through anthropometric measurements; mental ability through specially designed questionnaire and scoring or intelligence tests; and behavioural development through a specially designed proforma to evaluate the characteristics like punctuality, piety, obedience, respectfulness, sociability, co-operation,

concern for others, cleanliness, emotion, tolerance and leadership, on a group of primary school children (5-10 years) participating in a well organized school lunch programme and on a group of high school children (10-15 years), who had participated in the school lunch programme as against their counter parts who had never participated in any school lunch programme, under different environmental conditions.

II. REVIEW OF LITERATURE

Review of literature pertaining to this study on the impact of school lunch programme on physical, mental and behavioural development of school children is presented under the following headings:

A. Importance of nutrition in childhood.

B. Effect of nutrition on growth and physical development.

C. Malnutrition and mental ability.

D. Nutrition as a causative factor for behavioural changes

and E. Role of school lunch programme in promoting the allround development of children.

A. Importance of nutrition in childhood:

Childhood is a crucial period in terms of growth and development. School age in particular is a dynamic period of physical growth and development. Children in this age group are playful and very active. The nutritional requirement of children are different and higher per unit of body weight than those of adults (Devadas, 1966; Taneja, 1967; Camcam, 1969; FAO, 1970; Koshi et al 1970 and Devadas et al, 1972).

School children form an important segment of India's population and constitute about 20 to 25 per cent of the total population (Gopalan and Vijayaraghavan, 1971). This assumes importance in the national set-up for good nutrition in this age becomes the primary determinant of human performance and thus national development (Calcutta Food Habits Survey, 1972).

Unfortunately in the developing countries, childhood is marred by malnutrition, leading to high mortality and morbidity rates (Devadas et al 1970; 1971). Gopalan (1964) proclaimed that the high incidence of protein-calorie malnutrition among weaned infants in India cripples the growth of the nation. Out of hundred million children in the age group between one to six years, almost half the number are victims of protein-calorie malnutrition in one form or other (Gopalan, 1973 and Thackar, 1974).

Oberoi (1972) proclaims malnutrition to be an important cause of infant and child mortality, stunted physical growth, low work output, premature ageing and reduced span of life. Gopalan and Vijayaraghavan (1971) have reported that judged on the basis of their body weights, 56 per cent of children were suffering from grade II malnutrition (moderate) and 15 per cent from grade III (severe). It has been reported that as many as 20 per cent of the children in the 5-12 year age group often show one or more signs of deficiency disease. Heights and weights of these children are generally lower than those of western children of corresponding ages (Vijayaraghavan, 1973).

Rajagopalan (1974) has estimated that there exists a 20 per cent deficit in the calorie intakes of the children. This deficit may be the most important factor for the poor growth and school performance of the majority of our school children.

Mineral deficiencies are not common per se but are usually seen with deficiencies of protein and vitamin and certain infections (Gopalan, 1971). Iron deficiency anemia may co-exist with hook worm infection and severe protein malnutrition (Mayoral et al, 1967; Apte, 1971 and Morehead et al, 1974).

Rajagopalan (1974) also observed that the most common nutritional deficiency among school children were that of vitamin A, B complex and Iron. The cost of malnutrition related morbidity in the school age in Tamil Nadu alone has been estimated to be Rs. 60 lakhs (Rajagopalan, 1974). Shah and Udani (1969) have recorded that 8.7 per cent of the total deaths in India occur in the 5 to 14 year age group.

The fight against this ghastly problem of malnutrition and deficiency diseases is being helped by a growing awareness and understanding of the part nutrition plays in health by raising standards of living and by developments in agriculture and food technology (Soni, 1973). While it is universally recognised that the strategy to fight malnutrition is intimately tied up with the strategy to reduce poverty and augment food production. To achieve economic development with social justice, the development strategy should focus on integrating various programmes to bring out a synthesis of the best in human culture. In this effort a properly planned school meal has a great role to play.

B. Effect of nutrition on growth and physical development:

Rate of growth of children varies with the environment in which they live. Better nutritional environment of children in higher socio-economic community accelerates growth and the poor nutritional environment in the lower socio-economic group retards it.

Good nutrition is of paramount importance in fostering the physical, mental and emotional development of children (Chow, et al 1968 and Devadas et al 1972). It has been decisively proclaimed by many experts that no single factor

in children's life determines his normal growth or development as decisively as proper nutrition (Ghosh, 1966; Devadas, 1971 and NIN, 1973).

Patel et al (1974) has provided suggestive evidence that the social background influences the child's physical growth, intellectual development and learning abilities. Cravioto et al (1974) postulated that nutrition is an important variable which plays an intervening role between social background on the one hand and physical growth and development of intelligence and cognitive skill on the other. Cravioto et al (1966) and Kelein et al (1972) have proved that there are complex interrelationships between child's material and social environment, psychological test performance, nutrition and his growth and development.

In the study of winter (1973) he showed that a correlation between nutritional status and verbal skills was observed in the first few years of life. But at 5-7 years no difference could be noted by the food supplementation. Monckebery (1973) in his study, showed that at 6 years of age the children's height, head circumference, the intelligence quotient (I.Q.) were below the average for the normal standard in the country.

Chase and Martin (1970) compared a group of 19 children malnourished in the Ist year of life. He showed that one half years later, the previously undernourished children had deficiencies in height, weight, head circumferences and intelligence.

C. Malnutrition and mental ability:

The effects of malnutrition on the activity and development of the brain have received increasing attention. Recent research has revealed a link between

malnutrition in infancy and early childhood and impaired learning and behaviour in later life (Frisch, 1970; Cravioto, 1970; Srikantiah and Sastry, 1971; Ganguly et al, 1972, Mehta et al, 1972 and Kokrady et al, 1972). It has been claimed that undernutrition in infancy and childhood may cause irreversible damage and prevent the child from attaining its full potential (Lang et al 1967; Gadders 1967; Bachawat, 1972 and Nursery Journal, 1973).

Chandau (1963) and the Indian Freedom From Hunger Campaign Society (1972) also agree that malnutrition is an invisible peril which damages from within. Severe malnutrition in children produces disturbances in both behaviour and mental capacity, (ie) extreme apathy, lack of interest in the environment and poor reaction to any stimulus or reaction with a monotonous and plaintive cry (Monckeberg et al, 1972). Birch (1972) postulates that by inhibiting the development of a primary process essential for cognitive growth, malnutrition interferes with the orderly development of experience and contribute to a sub-optimal level of intellectual functioning.

Frisch (1970), Gopalan (1973) and Thackar (1974) warns that there are evidences that malnutrition leads to health hazards like oedema, growth retardation, mental depression and other deficiencies.

The extensive evidence available from research on experimental animals and the limited but very suggestive data collected on samples of children, who had suffered from malnutrition in various parts of the world show that malnutrition during certain critical periods of brain development may produce permanent impairment of brain structure and functions, (McCance and Widdowson, 1968 and Dobbing and Surat, 1973).

Studies of Winick and Nobel (1907) on rats, Platt and coworkers (1968) on weaning rats and puppies, Barnes (1969) and Barnes et al (1970) on pigs, rats and dogs and Dobbing (1971) on rats have established beyond doubt that dietary restriction, during growth brings about histological damage of the central nervous system, lowered rates of cell division in the brain and adversely affects their ability to learn and their levels of emotionality.

Malnutrition interferes with a child's motiviation, power of concentration and learning capacity. According to Oyague (1971) 26 to 30 per cent of children in central America, Brazil and India repeat their first school year atleast once and 18 to 20 per cent repeat the second year, malnutrition being the main causative factor for this situation, and thus bringing home the fact that he is late in reaching the standard developmental norm.

A review of the studies of Hunt et al (1921), Heefer and Hardy (1928), Paul (1938), Kugelman et al (1944), Cravioto and Robles (1965), Brich and Balmont (1965), Kahn (1965), Cravioto and DeLicardi (1969) Stock and Smythe (1963), Guthrie and Guthrie (1969) have established beyond doubt the relationship between malnutrition and learning ability in children.

Studies of Champakam et al (1968), Cravioto et al (1971), Tropical Metabolism Research Unit of the Medical Research Council (1973), Monkeberg (1973), Cravioto and Delicardie (1973) and Cravioto et al (1974) with school age children strongly suggest that an episode of chronic severe malnutrition in early life would increase the risk of scoring, both intelligence tests and in the level of neurointegrative development, quite below the expected values of the specific socio-economic class of children understudy.

Odom (1967), Sear and Salapatele (1971), Birch (1972) Nutrition Review (1973), Kallar (1973) and Barbara et al (1974) proclaim that good nutritional intake influences a child's ability to perform well in classes and points out patterns of child care, cultural performance, style of play, depressed motivation, value systems and instructions as factors which contribute to lowered intellectual level and poor academic performance in disadvantaged children.

Patel (1973), Kelein et al (1974) and Krishnaswamy et al (1974) have provided suggestive evidence that social background also influences the child's physical growth, intellectual development and learning abilities. It is postulated that nutrition is an important variable which plays an intervening role between social background on the one hand and physical growth and development of intelligence and cognitive skill on the other. It has been rightly suggested by Srikantiah and Sastri (1971) that it is very difficult to assess the extent to which malnutrition and non-nutritional factors can contribute to the poor mental performance of children who have once suffered from malnutrition since these factors almost always co-exist. It is apparent that children who survive a severe episode of malnutrition of sufficient duration early in life are handicapped in learning some of the more fundamental academic skills and are therefore less able to profit from the cumulative knowledge available to the human species in general and to their socio-economic group in particular (Cravioto and DeLicardie, 1973).

D. Nutrition as a causative factor for behavioural changes:

Social and nutritional deprivation undoubtedly interact so as to modify the resulting behavioural characteristics (Barner, 1971). The learning process may be disrupted by adverse changes in personality, emotionality and behaviour of the child.

Malnutrition and the order of birth plays an important role in influencing personality and behaviour (Desai, 1971). Malnutrition affects responsiveness of parental behaviour by altering behavioural characteristics of the child (Cravioto, 1966 and Hey Wood, 1972).

Birch (1972) in his study showed that, it is probable that behavioural changes that will be most prominent in individuals, who were severely malnourished in early life will reflect changes in emotionality and elevated response levels to aversive stimuli.

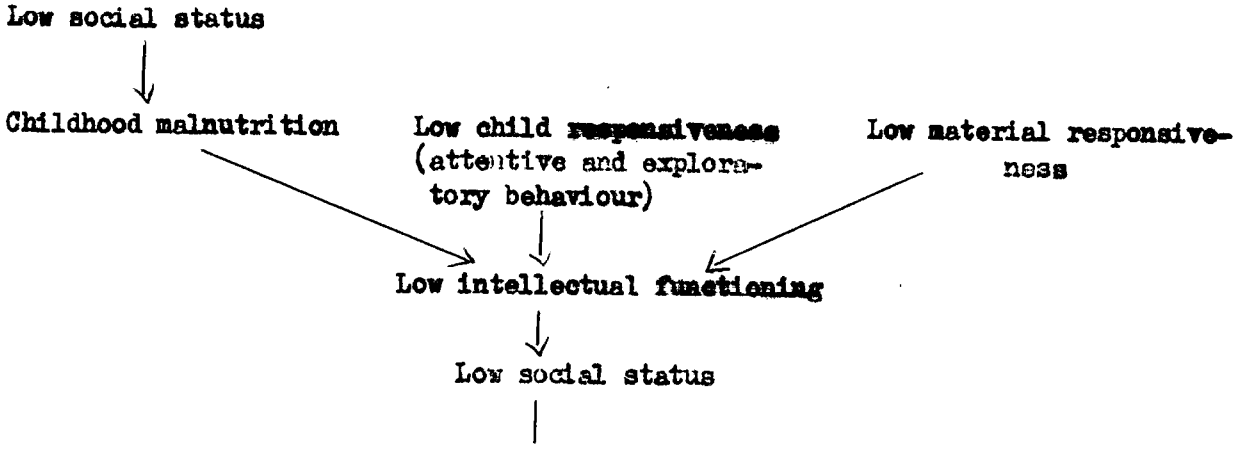
Feeding, eating and food intake have been referred to as frequent arena for either oppositional or passive aggresive behaviour of a child by Martin (1973). He proclaims that feeding and eating are the arena for so much acting out of conflict between child and family that dietary histories must not focus solely on the amounts of foods that have been taken but on the behaviours associated with the feeding experience.

Social familial factors seem to play an important role in school age. Malnutrition contributes less social behaviour in children. Both malnutrition and behaviour and social environmental factors and cognitive development have been consistently shown to be co-related (Nutrition Reviews, 1973). Studies that have attempted to assess the relative contribution of moderate malnutrition (or

undernutrition) and social factors to later intellectual performance have frequently found that malnutrition does play a role apart from factors related to social status (Nutrition Reviews, 1973).

Tizard (1973) showed in his study on children hospitalized for severe clinical malnutrition in the first few years of life that the ill effects on malnutrition persist throughout the growth period and influences their behavioural development as well. Cravioto et al (1974) observed that the children who had suffered severe malnutrition had lesser behavioural response as well as less IQ level.

From the results of their investigations, Niels Christiansen et al (1974) postulates a visual cycle of low social status, malnutrition, behavioural response and the intellectual function of the child as outlined below:



E. Role of school lunch programme in promoting the allround development of children:

School lunch programme is not only a tool of education but also makes a substantial contribution to the learning capacity of the children (Devadas, 1970 and McRobert, 1972). According to Smith (1967) school lunch programme helps the pupils to develop a liking for nutritious foods and to overcome food prejudices. By participating in the good school lunch programme, children are guided in food selection and are familiarised with the essentials of an adequate diet.

Ritchie (1963), Leavone (1967), Briggs (1970) and Ross and Esqueb (1970) claims that the preparation and cooking of meals in the school premises can be used to teach good dietary habits, which will have an important influence during the life time of children. The concept of learning by doing is the major feature of the school lunch. School meals prepared and supplied under clean and hygienic conditions will teach children the importance of cleanliness before, during and after meals (Briggs, 1970 and Radharukmani, 1966).

Will (1968) opines that, in addition to offering a nutritionally satisfactory and esthetically pleasing meal, the school feeding programme can aid other segments of school nutrition. School meal is intended to supply education in table manners and social habits also. The physical, mental and social outcomes of school feeding programmes have been evaluated by Devadas and co-workers (1964, 1967 and 1972) and their results have provided the beneficial effects of school lunch programme. According to Devadas (1972) the following are the goals of the school feeding programme:

1. Gaining knowledge of the nutritional facts.
2. Appreciating the importance of good nutrition to health, well-being, growth and development.
3. Translating the nutritional facts into actual consumption to eat desirable combination of foods.
4. Developing good food habits

and 5. Increasing school attendance and performance through increased learning ability and stamina and avoiding illness and absenteeism due to nutritional deficiencies.

School lunch plays a true role in manpower development by bringing about better attendance, less illness and improved ability to concentrate (Gopalan 1968, Ross et al 1970 and Sundaravadivelu 1970).

Colby (1968) and Hollingsworth (1972) state that the school meal service has helped to produce a generation of children taller and heavier, and is more than just a filling station for empty stomach. McClary (1966) indicates that the psychology of school lunch can be taught as the art of dealing with the behaviour of people their attitudes, their feelings, their intellectual ability and aspirations.

Scrimshaw (1970) and Chase and Martin (1970) showed that the children receiving supplementary foods at the school had higher height, weight, head circumference and better learning ability and a long-term memory power over that of the group who did not receive any supplement.

Thus as Bander (1974) points out school lunch is more than just food. School lunch is nourishment, sociability, pleasant rest break and financial assistance.

III. EXPERIMENTAL PROCEDURE

The experimental procedure pertaining to this study on the impact of school lunch programme on physical, mental and behavioural development of school children comprised of:

A. Selection of the schools and subjects.

B. Assessment of the physical development.

C. Measurement of the mental ability

and D. Evaluation of the behavioural trends.

A. Selection of the schools and subjects:

Two schools namely Sri Avinashilingam Primary School and Sri Avinashilingam High School were selected for the study because:

1. The authorities of the two schools were very co-operative and willing to help.

2. A well organised school lunch programme is in operation in this primary school.

3. Children (Girls) from this primary school continued their studies in this high school.

and 4. Both the schools were situated in one campus.

In order to assess the impact of the school lunch programme on the children participating in the school lunch programme, 107 primary school children in the age group of five to ten years, currently participating in the school lunch programme were selected for the study. For comparison a control group of 107 children comparable in age, sex and socio-economic status who were not

participating in the school lunch programme were also selected. To further evaluate the longstanding impact of school lunch programme, a group of the available 47 children (10-15 years old girls) who had participated in the same school lunch programme while they were in the primary school were selected. These children were in the VI, VII and VIII standards respectively. A comparable group of 47 children from the same classes who had never participated in any school lunch programme during their primary school education served as the control group.

B. Assessment of the physical development:

Physical development of the primary school children was assessed using the anthropometric measurements such as height, weight, head circumference, chest circumference and arm girth (Gowrinath, 1974 and Sureea Rao, 1974). Measurements of heights and weights constituted the indices of physical development for children of the age group 10 to 15 years. These measurements were done as per the standard procedures taking care to observe all the precautions, (Gopalan, 1971).

In order to correlate the physical development to the food intake, a three day food weighment survey was conducted on a randomly selected group of primary school children and the intake of calories and protein computed using the ICMR (1971) food composition table.

C. Measurement of the mental ability:

A set of specially designed tests as outlined in Appendix I formed the measurement of the mental ability of the primary school children (5-10 year old).

The tests called for observations on reasoning, vocabulary, pattern drawing, memory, identification, discriminating abilities, spatial relationship and numerical relationships and was evolved by the investigator and tested with the guidance of the child development and psychology department of her college. The children's responses to the tests were evaluated on a 50 point scale and depending on the correct responses of the children, the total scores for each child computed.

In order to measure the mental ability of the 10-15 year old children, the standard "OTIS quick scoring mental ability test" as given in Appendix II was used. This consists of an objective type of testing with a series of 80 questions with suggested answers, each correct answer carrying one score. These questions called for observation on reasoning, vocabulary, memory, identification, numerical and arithmetical reasoning and the like. The questionnaire was administered to each child and asked to mark the correct answer and from the correct answer given, the Intelligence Quotient calculated using the procedure outlined in Appendix III.

D. Evaluation of the behavioural trends:

A specially constructed proforma (Appendix IV) was used to evaluate the behavioural trends. The characteristics chosen to represent the behavioural aspects were punctuality, piety, obedience, respectfulness, sociability, co-operation, cleanliness, leadership and tolerance. A five point rating scale to quantify the different degrees of the above mentioned characteristics was chosen and used to evaluate under different conditions like classroom, lunch room, out door and extracurricular activities and at home. The children were

assessed for all the characteristics under the different environmental conditions as stated above, by the parents, teachers and the investigator. In order to avoid bias, the investigator allowed the parents and teachers to take their own time to rate their children after they were properly oriented. As Freeman (1968) and Morly (1970) have recommended, rating scale is one of the best instruments which permits quantification of observations. The family background, of the children and the opinion of the parents towards school lunch were also collected.

IV. RESULTS AND DISCUSSION

The results of this investigation on the impact of school lunch programme on physical, mental and behavioural development of school children are presented and discussed under the following headings:

A. Physical development of the children.

B. Mental ability of the children.

C. Behavioural pattern of the children.

D. Socio-economic background of the families and behavioural pattern of the children

and E. Parents' opinion towards the school lunch.

A. Physical development of the children:

1. Primary school children:

The physical development of the children participating and not participating in the school lunch programme was evaluated through the indices of the anthropometric measurements namely the heights, weights, head circumference, chest circumference and armgirth. These measurements were taken for all the 107 children participating in a well organized school lunch programme in the primary school and for a comparable group of 107 children from the same primary school who were not participating in the school lunch programme. The mean values obtained for the anthropometric measurements on the two groups along with the statistical analysis are presented in Table I. The individual values are presented in Appendix V.

TABLE I

ANTHROPOMETRIC MEASUREMENTS OF THE TWO GROUPS OF CHILDREN IN THE PRIMARY SCHOOL

Measurements	School lunch group Mean ± S.D.	Non school lunch group Mean ± S.D.	't' value
Height (Cm)	119.80± 9.40	115.80± 10.90	3.80**
Weight (kg)	19.75± 3.92	18.67± 4.28	2.00*
Head circumference (cm)	52.50± 2.71	48.10± 2.83	11.50**
Chest circumference (cm)	55.50± 3.64	55.00± 3.86	0.98
Arm girth (cm)	17.70± 1.30	16.60± 0.70	4.6**

* Significant at five per cent level
** Significant at one per cent level

The differences in the height between the two groups was significant at one per cent level indicating the better growth trends of the school lunch group over that of the non-school lunch group. The difference in weight was significant at five per cent level again pointing out that children participating in the school lunch programme showed better physical development over that of the children not participating in the school lunch programme. When head circumference is taken into consideration, there again is a difference between the non school lunch and school lunch group which is significant at one per cent level. Similar results were obtained for the arm girth measurements also, the school lunch group being significantly ($P < 0.01$) superior over the non-school lunch group. The difference in the measurement of the chest circumference, was not significant although the same trend as observed in the other measurements was evident.

The above summarisation of the anthropometric measurements of the two groups of children clearly indicated that the physical development of children participating in the school lunch group is definitely better than that of the children not participating in the lunch programme.

In order to further evaluate the impact of the school lunch programme in promoting the physical development of the children, a food weighment survey was conducted on randomly selected children from the primary school groups. All the children selected under the school lunch group, had their lunch at school and all other meals at home. The contribution of the home diet to the food consumption pattern of the children was assessed by quantifying the food intake of the randomly selected children from each group and by calculating their calorie and protein intakes. The average values for calories and protein of the school lunch (600 calories and 15 g of protein providing one third of the recommended allowance for children of this age group) was added to the nutrient intake from home diets to give the food consumption pattern of the children and the data are presented in Table II.

TABLE II

MEAN DAILY CALORIE AND PROTEIN INTAKE OF CHILDREN

Groups	Calories	Protein (g)
School lunch	1603	32.2
Non School lunch	1343	25.4
Recommended Allowances ICMR (1971)	1800	32

The calorie intake of children participating in the school lunch programme was 1603 meeting 90 per cent of the calorie requirement recommended for this age group (ICMR, 1971). On the other hand the calorie intake of the non school lunch group was only 1343 meeting only 75 per cent of the ICMR recommended allowances for this age group. The protein intake also showed the same trend, while the school lunch group met the recommended intake of protein (32.2 g) the non school lunch group with an intake of 25.4 g met only 78 per cent of the requirement recommended by the ICMR (1971) for this age group. This clearly brings out the fact that due to a lower calorie as well as protein intake, the non-school lunch fairs lower when compared to the school lunch group in the physical development. This enables us to speculate that the school lunch which is planned to provide one-third of the days recommended allowances, although does nàt fill the calorie gap in the present population, still from the stand point of nutritional status, has a definite benefit to offer to the school children.

2. High school children:

In order to further evaluate the role of school lunch programme in fostering the physical development of children; a group of high school children (10-15 years of age) who had participated in the same school lunch programme when they were in the primary school were selected and their heights and weights compared with a comparable group of their counterparts who had never participated in any school lunch programme. The mean heights and weights of children in the two groups from high school are presented in Table III. The individual values for heights and weights for all the children is given in Appendix VI.

TABLE III

HEIGHTS AND WEIGHTS OF THE TWO GROUPS OF CHILDREN IN THE HIGH SCHOOL

Indices	Groups	Mean S.D.	't' value
Height (cm)	School lunch	142.8 ± 8.64	3.6**
	Non School lunch	140.6 ± 9.00	
Weight(kg)	School lunch	35.0 ± 7.16	2.2*
	Non School lunch	31.8 ± 7.00	

** Significant at one per cent level
* Significant at five per cent level

The mean height of the children who had participated in the school lunch programme was 142.8 cm whereas the mean height of children who had not participated in the school lunch programme was 140.6 cms and the difference between the two groups was significant at one per cent level.

The difference in the mean weights of children who had participated in the school lunch programme (35.0 kg) was significantly higher ($P < 0.05$) than that of the children who had not participated in the school lunch programme (31.8 kg). Thus the growth trends in both heights and weights of the high school children who had participated in the school lunch programme followed the same pattern as evinced by the primary school children who are participating in the school lunch programme when compared to their non-school lunch counterparts. The fact that the children in the school lunch group from both the categories are taller and heavier than their non school lunch peers leads us to hypothesize that in the long run, participation in a well organised lunch programme offers scope for physical

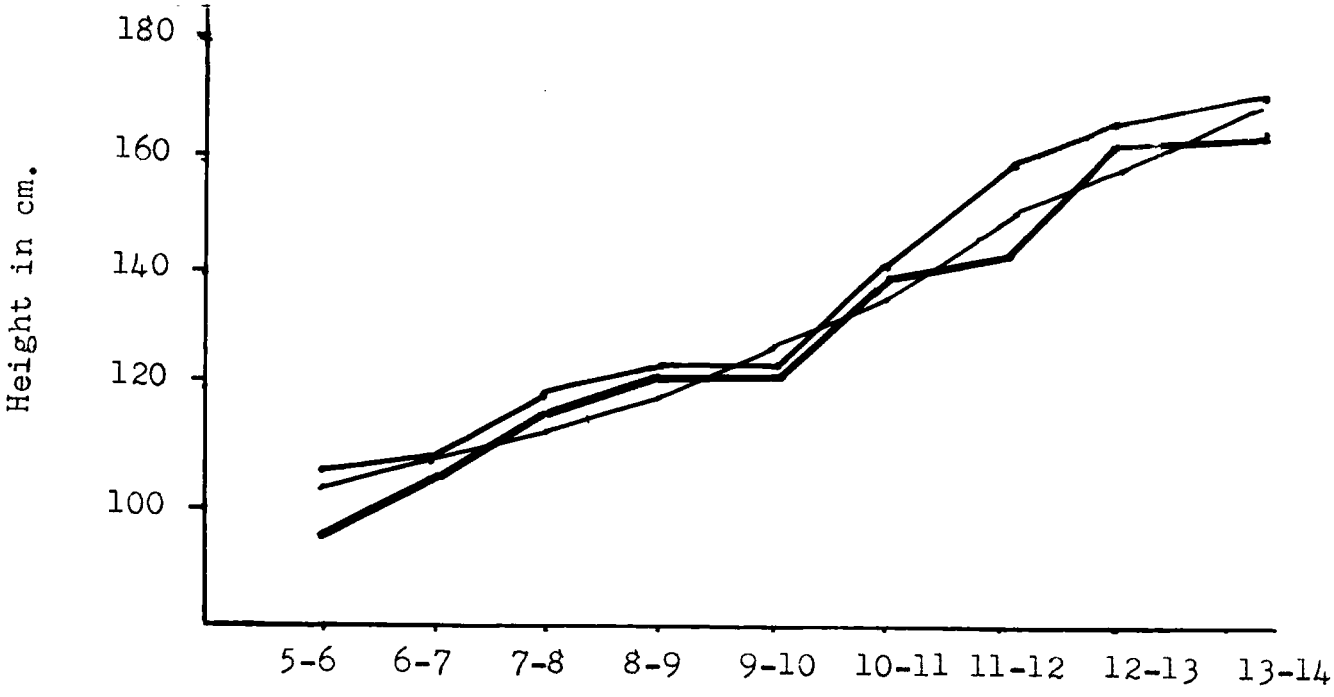


FIGURE I

TRENDS IN HEIGHTS OF CHILDREN

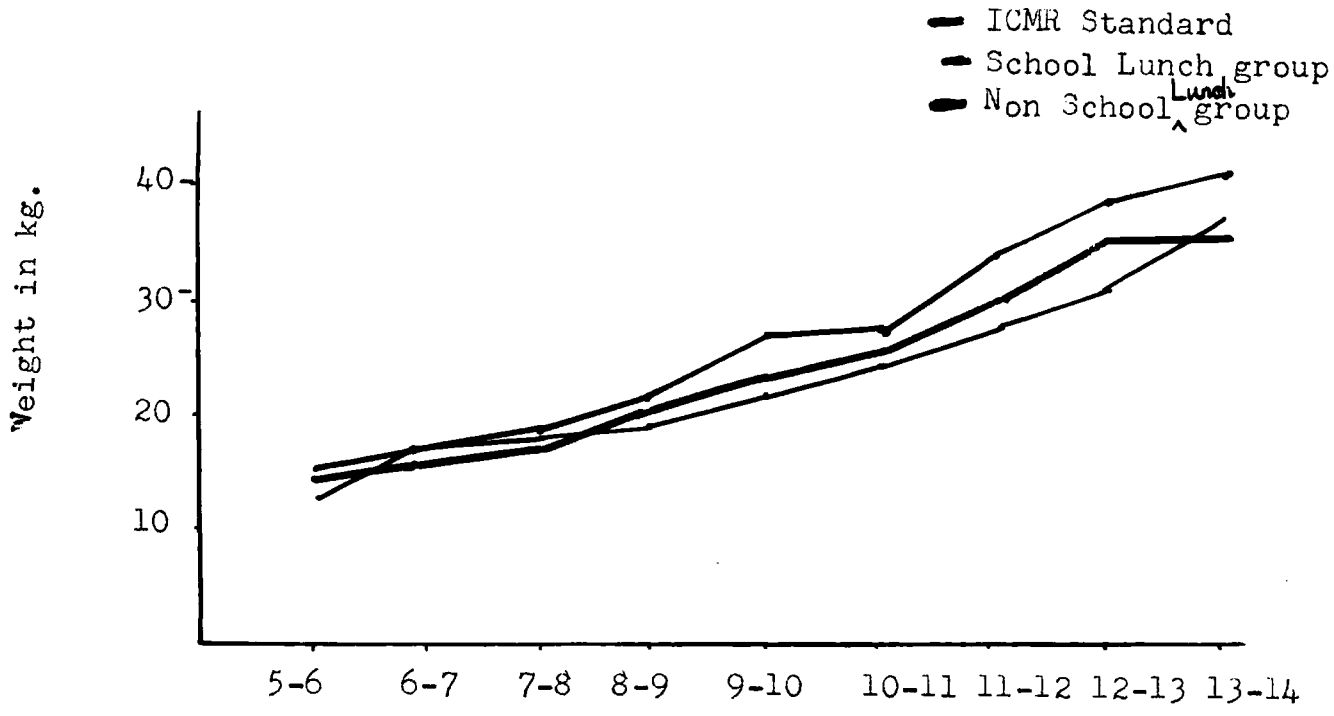


FIGURE II

TRENDS IN WEIGHTS OF CHILDREN

development of the children. This finding is in close agreement with that of the findings of Devadas et al (1964, 1964, 1967-74, 1972) who have established the beneficial effects of the school lunch programme on the growth of children as well as the longitudinal growth trends of children participating in the lunch programme.

It may be interesting at this point to compare the mean heights and weights of the groups of children in this study with that of the norms prescribed for Indian children (ICMR, 1971). Figures 1 and 2 represent the growth trends of children in this study as compared to that of the national norms. The growth trends of children in the school lunch group is superior to that of the national norms, for all age groups studied. Children in the non-school lunch group on the other hand either tend to have lower values or similar values to that of the national values. This again brings out the better physical development of children in the school lunch groups.

B. Mental ability of the children:

The mental ability of the children in the two groups of the primary school, was assessed by the use of the specially designed set of questions by the method of scoring. The scores obtained by the two groups of primary school children along with the statistical analysis is given in Table IV, and the individual scores are presented in Appendix VII.

TABLE IV

MEAN SCORES FOR MENTAL ABILITY OF THE PRIMARY SCHOOL CHILDREN

(Max. Scores: 50)

Groups	Mean Score ± S.D.	't' value
School Lunch	37.78 ± 6.75	4.83**
Non School Lunch	32.37 ± 9.46	

**Significant at one per cent level

The mean score obtained for mental ability by children in the school lunch group was 37.78 whereas that of children in the non-school lunch group was 32.37. The difference between the groups was significant at one per cent level. Other conditions being comparable the higher scores obtained by the children in the school lunch group may be attributed to the participation in a well established school lunch programme.

The mental ability of the children in the high school groups who had participated or who had never participated in the school lunch programme was assessed by the use of standard "OTIS test for mental ability" and the I.Q. obtained for the two groups of children is presented in Table V. The individual I.Q. levels of all the children is given in Appendix VIII.

TABLE V

I.Q. FOR THE TWO GROUPS OF CHILDREN IN THE HIGH SCHOOL

Groups	Mean I.Q ± S.D.	't' value
School Lunch Group	94.85 + 5.90	3.1**
Non School Lunch group	90.20 + 8.25	

**Significant at one per cent level

The I Q obtained for both the groups of children were in the average range (Turman's Scale). The I Q for children who had participated in the school lunch programme (94-85) was significantly ($P < 0.01$) higher than that of the I Q obtained for the children who had never participated in any school lunch programme. This brings out clearly the possible lasting impact of the school lunch programme on the mental ability and development of children.

At this juncture it may be interesting to examine the possible co-erelation of mental ability score with that of the protein and calorie intake and that of the measurements of head circumference.

Tables VI and VII give the information on protein intake and mental ability scores and calorie intake and mental ability scores of the primary school children.

TABLE VI

CORRELATION BETWEEN PROTEIN INTAKE AND MENTAL ABILITY SCORES OF THE PRIMARY SCHOOL CHILDREN

Mental ability score	Protein intake (g)		
	26-30	31-35	36-40
21 - 30	2	-	-
31 - 40	7	2	-
41 - 50	1	2	1

γ = 0.35

TABLE VII

CORRELATION BETWEEN CALORIE INTAKE AND MENTAL ABILITY SCORES OF THE PRIMARY SCHOOL CHILDREN

Score	Calorie intake			
	1100 to 1300	1300 to 1500	1501 to 1700	1701 to 1900
21 - 30	-	2	-	-
31 - 40	1	5	3	-
41 - 50	-	1	2	1

γ = 0.42

There is a positive correlation between both protein intake and calorie intake and mental ability.

The correlation between the mental ability score and the head circumference of the children in the primary school is given in Table VIII.

TABLE VIII

CORRELATION BETWEEN HEAD CIRCUMFERENCE AND MENTAL ABILITY SCORES OF PRIMARY SCHOOL CHILDREN

Score	Head circumference (cm)			
	40–45	46–50	51–55	56–60
0 – 10	-	2	1	-
11 – 20	-	4	-	-
21 – 30	1	21	6	1
31 – 40	5	69	41	-
41 – 50	-	26	36	1

$r = 0.26$

Here again the po-sitive relationship between the measurement of head circumference and mental ability scores is clearly brought out.

C. Behavioural pattern of the children:

The various components of behaviour in the two groups of children, both in the primary and high school were assessed using the specially designed proforma by the scoring procedure. The proforma was designed to assess 13 behavioural aspects namely puncutality, piety, obedience,

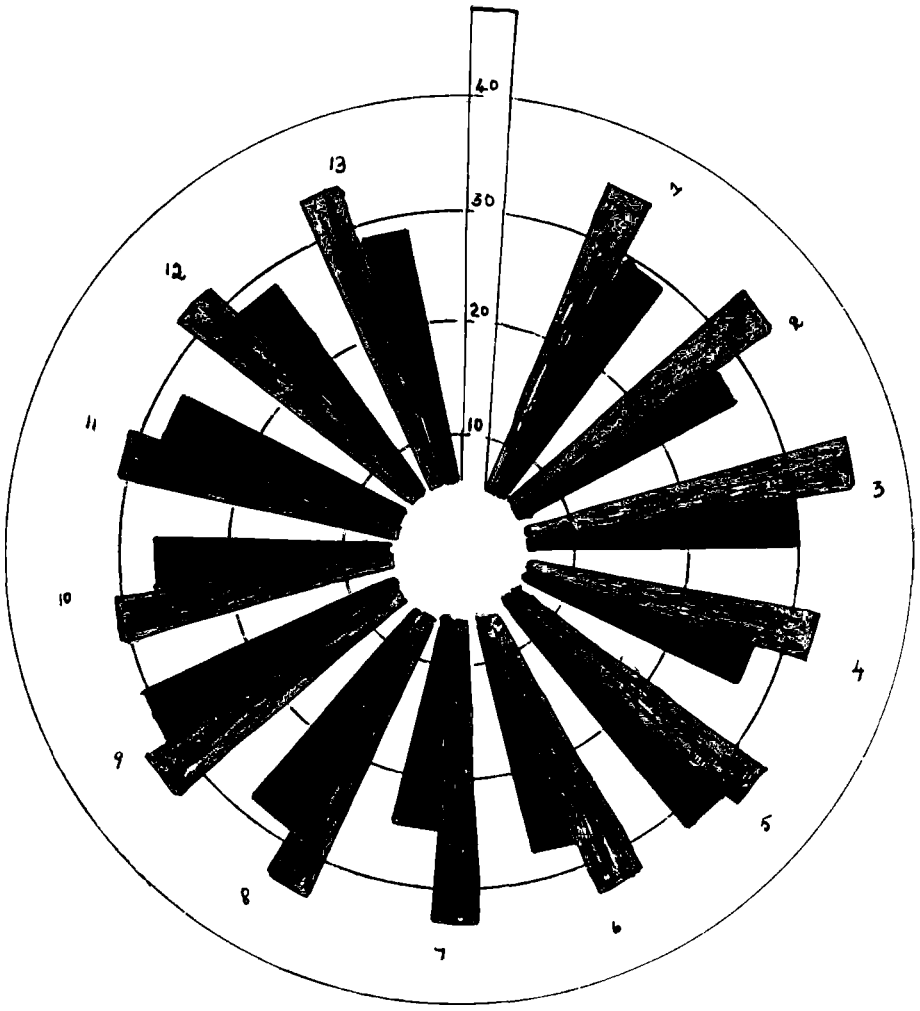


FIGURE III

MEAN BEHAVIOURAL SCORES FOR THE TWO GROUPS OF CHILDREN

1. Punctuality
2. Piety
3. Obedience
4. Orderliness
5. Respectfulness
6. Co-operation
7. Sociability
8. Concern for others
9. General apperance
10. Cleanliness
11. Leadership
12. Emotion
13. Tolerance

— School Lunch group

— Non School Lunch group

[redacted], [redacted], co-operation, sociability, concern for others, general appearance, cleanliness, leadership, emotion and tolerance individually by the investigator, by the teacher and by the parents in the class room, lunch room, at extra-curricular activities and at home respectively. The rating scale was based on a five point scale and hence the maximum possible score was 65. Mean values obtained for each of the various behavioural aspects as evaluated by the investigator, teachers and the parents in the class room, lunch room, at extra-curricular activities and at home respectively are presented in Table IX.

TABLE IX

MEAN BEHAVIOURAL SCORE OBTAINED BY THE CHILDREN UNDER DIFFERENT CONDITIONS AS EVALUATED BY THE INVESTIGATOR, TEACHERS AND PARENTS

No.	Behavioural aspects	Groups	Conditions						
			Class room		Lunch room		Outdoor activities		Home parents
			T	I	T	I	T	I	
1.	Punctuality	S.L.	4.40	4.42	4.42	4.450	4.54	4.54	4.72
		N.S.L.	3.87	3.87	3.87	4.40	4.00	4.00	4.26
2.	Piety	S.L.	4.12	4.14	4.16	4.18	4.10	4.10	4.34
		N.S.L.	3.46	3.48	3.44	3.44	3.31	3.30	3.80
3.	Obedience	S.L.	4.32	4.30	4.34	4.38	4.32	4.38	4.78
		N.S.L.	4.13	4.13	4.20	4.20	4.13	4.13	4.36
4.	Orderliness	S.L.	3.94	3.94	4.02	4.02	3.96	3.94	4.16
		N.S.L.	3.70	3.70	3.70	3.70	3.90	3.90	3.96
5.	Respectulness	S.L.	4.42	4.42	4.44	4.44	4.42	4.44	4.54
		N.S.L.	4.40	4.40	4.40	4.40	4.30	4.30	4.40
6.	Cooperation	S.L.	4.26	4.26	4.28	4.30	4.26	4.28	4.46
		N.S.L.	4.00	4.00	4.02	4.02	3.98	3.98	4.00
7.	Sociability	S.L.	4.30	4.32	4.30	4.28	4.30	4.28	4.52
		N.S.L.	4.20	4.20	4.20	4.20	4.20	4.20	4.20
8.	Concern for others	S.L.	4.44	4.48	4.48	4.48	4.44	4.44	4.46
		N.S.L.	3.60	3.60	3.60	3.60	3.60	3.60	3.90
9.	General appearance	S.L.	4.44	4.44	4.46	4.44	4.46	4.46	4.50
		N.S.L.	4.30	4.30	4.30	4.30	4.30	4.30	4.40
10.	Cleanliness	S.L.	3.69	3.69	3.69	3.69	3.69	3.69	3.98
		N.S.L.	3.40	3.40	3.40	3.40	3.40	3.40	3.40
11.	Leadership	S.L.	3.57	3.57	3.57	3.57	3.57	3.59	3.82
		N.S.L.	3.42	3.42	3.42	3.40	3.40	3.40	3.58
12.	Emotion	S.L.	4.00	4.04	4.04	4.06	4.06	4.00	4.16
		N.S.L.	3.80	3.80	3.80	3.80	3.80	3.80	3.80
13.	Tolerance	S.L.	4.48	4.48	4.48	4.46	4.46	4.51	4.66
		N.S.L.	4.20	4.20	4.00	4.00	4.00	4.00	4.20

T = Teacher; I = Investigator

It is evident from the table that the values obtained for the behavioural changes in case of both the groups of children when evaluated at different environmental conditions or when evaluated by different people did not vary at all so much so that they were identical in many instances. Hence, it was decided to pool all the values for different conditions together for each individual and compute the mean score for each behavioural aspect. The data thus computed along with the statistical anlysis is given in Table X. The total scores obtained by each individual child is given in Appendix IX.

TABLE X

MEAN SCORES FOR THE BEHAVIOURAL CHANGES FOR THE TWO GROUPS OF CHILDREN

(Max. Score: 35)

No.	Behavioural aspects	Groups	Mean ± S.D.	't' value
1.	Punctuality	S.L.	32.8 ± 3.56	7.7**
		N.S.L.	30.4 ± 5.65	
2.	Piety	S.L.	32.2 ± 5.05	7.5**
		N.S.L.	27.4 ± 6.36	
3.	Obedience	S.L.	32.2 ± 3.50	4.0**
		N.S.L.	30.2 ± 5.18	
4.	Orderliness	S.L.	32.3 ± 3.74	7.5**
		N.S.L.	28.1 ± 5.94	
5.	Respectfulness	S.L.	33.2 ± 2.60	2.2*
		N.S.L.	32.4 ± 3.74	
6.	Co-operation	S.L.	32.9 ± 4.03	7.7**
		N.S.L.	28.0 ± 6.80	
7.	Sociability	S.L.	33.3 ± 3.36	13.9**
		N.S.L.	24.9 ± 6.90	
8.	Concern for others	S.L.	33.7 ± 2.92	9.6**
		N.S.L.	29.2 ± 5.95	
9.	General appearance	S.L.	33.0 ± 3.53	4.8**
		N.S.L.	30.8 ± 4.62	
10.	Cleanliness	S.L.	31.1 ± 4.93	5.0**
		N.S.L.	27.7 ± 6.70	
11.	Leadership	S.L.	31.0 ± 2.83	7.2**
		N.S.L.	26.2 ± 7.30	
12.	Emotion	S.L.	32.5 ± 4.39	5.0**
		N.S.L.	29.3 ± 6.63	
13.	Tolerance	S.L.	32.9 ± 3.78	7.2**
		N.S.L.	28.5 ± 6.63	

*Significant at five per cent level
**Significant at one per cent level

There was a highly significant ($P < 0.01$) difference in the mean scores obtained for each of the behavioural aspects by the children participating and not participating in the school lunch programme. The consistently higher values obtained by the children participating in the school lunch programme for the behavioural aspects like puncutality, piety, obedience, orderliness, respectfulness, cooperation, sociability, conern for others, general appearance, cleanliness, leadership, emotion and tolerance speaks for itself the abundant scope school lunch offers in shaping the behavioural patterns of children. The fact that children in the high school also exhibited the same trend beyond doubt establishes the potentials of a well organized school lunch programme and its, lasting impact.

Thus viewing from all the three aspects studied namely the physical, mental and behavioural development, school lunch group is superior to that of the non-school lunch group. Moreover, the fact that the same trend in all the indices is evinced by the high school children who had participated in the school lunch programme while they were in the primary school, speaks volume to the long lasting effect of the well organized school lunch programme on the allround development of the children. The results of the present study echoes the earlier views expressed by Ritchie (1963), Devadas et al (1964, 1964, 1967-74), Brigg (1970), Scrimshaw (1970), Chase and Martin (1970) and Hollingsworth (1972).

D. Socio-economic background of the families and behavioural pattern of the children:

As opined by Gordon (1970) children's behaviour is influenced in a large measure to the parent's level of aspiration and the socio-economic status of the families. Information was available on the income level of the families, educational status of the parents, type of family and the birth order of the children for all the children in this study. The association of the above factors with the behavioural scores of the school lunch and non-school lunch groups of children were assessed using the 'chi square' test. Table XI gives the data on the association between the income level and behavioural score of children in the school lunch and non-school lunch groups.

TABLE XI

DISTRIBUTION OF BEHAVIOURAL SCORES ACCORDING TO THE INCOME LEVELS OF THE FAMILIES OF THE TWO GROUPS OF CHILDREN

(Max. Score: 65; No. of children per group: 154)

Behavioural Scores	School lunch group Income level (Rs.)				Non School lunch group			
	0-300	301-600	601-900	above 901	0-300	301-600	601-900	above 901
21 - 40	5	2	5	3	10	7	6	12
41 - 60	25	21	26	15	22	28	16	16
Above 60	12	24	12	4	3	12	10	12
X^2 value		11.21				9.23		

There does not seem to be any significant association between the income level of the families and the behavioural pattern of the children in both the groups. Hence, whatever differences observed may be partly due to the better facilities provided in the school lunch room situations.

With regard to the educational level of the head of the family, Table XII gives the distribution of behavioural scores for both the groups.

TABLE XII

DISTRIBUTION OF BEHAVIOURAL SCORES ACCORDING TO THE EDUCATIONAL LEVEL OF THE THE HEAD OF THE FAMILIES OF THE TWO GROUPS OF CHILDREN

(Max. Scores: 65; No. of Children in each group: 154)

Behavioural Scores	School lunch group			Non School lunch group	
	Educational level of the head of the family				
	No education	Upto High School	Above High School	Upto High School	Above High School
21-40	—	13	2	28	7
41-60	12	69	6	56	26
Above 60	2	35	15	29	10
X^2 value		17.83*		2.14	

*Significant at five per cent level

There seems to be a significantly positive association between the level of education of the head of the family and behavioural scores of children in the school lunch group. As there is no evidence of association between these two variables in the non-school lunch group, it leads one to speculate the possible impact of the school lunch programme in moulding the behavioural development of children.

The behavioural scores of the children as classified with regard to the types of families is given in Table XIII.

TABLE XIII

DISTRIBUTION OF BEHAVIOURAL SCORES ACCORDING TO THE TYPE OF FAMILY OF THE TWO GROUPS OF CHILDREN

(Max. Scores: 65; No. of Children per Group: 154)

Behavioural Scores	School lunch group		Non School lunch group	
	Type of Family			
	Nuclear	Joint	Nuclear	Joint
21 - 40	10	5	22	13
41 - 60	37	50	46	36
Above 60	17	35	25	12
X^2 value	6.47*		2.05	

*Significant at five per cent level

A significantly positive association is observed between the type of family and the behavioural scores of the children in the school lunch group whereas this association is not evident in the case of the non-school lunch group. This may be due to the fact that in the school lunch group a larger number of children come from joint families which might influence their behavioural habits like cooperation, concern for others, tolerance, respectfulness and the like. It may also be partly as cascribed to the scope of school lunch programme in developing good behavioural habits like piety, sociability, responsibility, cooperation, tolerance, cleanliness etc.

The behavioural scores of the children in the two groups were distributed according to their birth order and the details are presented in Table XIV.

TABLE XIV

DISTRIBUTION OF BEHAVIOURAL SCORES ACCORDING TO THE BIRTH ORDER OF THE CHILDREN IN THE TWO GROUPS

(Max. Scores: 65; No. of Children per Group: 154)

Behavioural Scores	School lunch group					Non School lunch group				
	Birth Order									
	I born	II born	III born	IV born	Above IV	I born	II born	III born	IV born	Above IV
21 - 40	3	4	4	4	—	12	11	2	5	5
41 - 60	25	28	22	8	4	16	26	10	13	17
Above 60	18	23	4	2	5	5	7	6	7	12
X^2 value			17.67*					9.04		

*Significant at five per cent level

As in the case of other variables, birth order also seem to have a positive effect on the behavioural pattern of the children of the school lunch group. However, there is no significant association between these variables in the non-school lunch group. This again leads us to postulate the possible role of the school lunch programme in influencing the behavioural pattern of the children.

E. Parents opinion towards the school lunch:

This part of the questionnaire was answered only by parents of the children who were in the school lunch group.

1. Benefits derived from participation in the school lunch programme:

The advantages given by the parents for allowing their children to participate in the school lunch programme is given inTable XV.

TABLE XV

BENEFITS DERIVED FROM PARTICIPATION IN THE SCHOOL LUNCH PROGRAMME

S.No.	Reasons for participation in the school lunch programme	Number answering	Percentage
1.	Good for health	130	84.50
2.	Nutritious and balanced diet is provided	115	74.75
3.	Good eating habits were developed	70	45.50
4.	Participation in the school lunch saves time and increases study time	63	40.95
5.	Children's interest in participation	43	27.95
6.	Keeps them regular in attendance and better in class performance	35	22.75

A great majority of the parents consider the nutritional and health outcomes of the school lunch and hence take keen interest in allowing their children to participate in the programme. They are also aware of the other benefits derived from participation in the lunch programme namely better school performance, development of good dietary habits, behavioural adjustments and so on. These findings indicate the possibility that children in the school lunch carry home many an educational achievements they have and thus the parent also take interest in the programme.

2. Changes in habits observed in children by the parents due to their participation in the lunch programme:

Parents expressed that there were many changes in the behavioural pattern, eating habits, and food habits of children due to participation in the lunch programme. Their opinion is summarized in Table XVI.

TABLE XVI

CHANGES IN HABITS AS OBSERVED BY THE PARENTS DUE TO THE PARTICIPATION OF THE CHILDREN IN THE SCHOOL LUNCH PROGRAMME

S.No.	Changes in habits	Number answering	Percentage
1.	Increased consumption of greens and vegetables	142	92.30
2.	Increased knowledge of foods for better health	135	87.75
3.	Willingness to share responsibilities at home	120	78.00
4.	Avoiding wastage in eating	117	76.05
5.	Taking meals on time	111	72.15
6.	Punctual, regular and systematic	102	66.30
7.	Improved in their sociability	98	63.70
8.	Tolerance and cooperativeness	92	59.80
9.	Learning to clean plates and tumblers	70	45.50
10.	Able to concentrate and study	20	13.50

The opinion of the parents vividly bring out the beneficial effects of the school lunch programme on the various behavioural aspects of the children. This implies that their nutritional knowledge is improved and the behavioural aspects like sociability, cooperativeness, tolerance, punctuality, regularity and the like also improves due to participation in the lunch programme. These views are in line with the ratings observed for the behavioural changes in this study as well as the reported studies of Devadas et al (1964, 1964, 1967-74).

It may also be mentioned that the parents expressed the fact that due to the participation in the lunch programme children improved in their growth, general health and there was regularity in attending the school. These views

are in concurrence with the findings that participation in the school lunch improves their physical development. The fact that the children have improved their academic performance also correlates with the mental ability scores obtained.

The foregoing discussions bring out clearly the beneficial impact of the school lunch programme on the physical, mental and behavioural development of children participating in the school lunch programme. The long standing impact of the school lunch programme on these developmental areas was pictured by the results on the high school children who had participated in the school lunch programme when they were in the primary school, thus throwing light on the fact that school lunch programmes can help shape the destiny of the nations by bringing about an allround development of the children. In tune with the studies of Scrimshaw (1970) and Chase and Martin (1970) the children receiving supplementary foods at school had higher height, weight, head circumference and better learning ability along with better behavioural pattern than their counterparts who did not receive any supplements at school. These evidences lead one to conclude that school lunch offers immense scope for the physical, mental and behavioural development of children.

V. SUMMARY AND CONCLUSION

The impact of school lunch programme on the physical, mental and behavioural development of children was investigated by assessing the physical development, mental ability and behavioural pattern of a group of primary school and high school children who are or have been participants of a well organized school lunch programme as against their counterparts who were comparable in all respects except that they had never participated in any school lunch programme.

A group of 107 primary school children in the age group of 5 to 10 years, currently participating, in a well organized school lunch programme, and a group of 47 high school children of the age range of 10-15 years who had participated in the same school lunch programme when they were in the primary school formed the experimental group and a comparable sample of 107 children from the primary school and 47 children from the high school respectively formulated the control group. Anthropometric measurements including heights, weights, head circumference, chest circumference and arm girth for the primary school children and heights and weights for the high school children constituted the indices of physical development. A set of specially designed tests with scoring and the standard "OTIS quick scoring mental ability test" formed the index of the assessment of mental ability for the primary school and high school children respectively. A specially constructed proforma to

represent the various behavioural aspects like punctuality, piety, obedience, respectfulness, sociability, cooperation, cleanliness, leadership and tolerance quantified on a five point rating scale evaluated the behavioural patterns of the children.

The results revealed that:

1. The mean height, weight, head circumference, chest circumference and arm girth for the school lunch programme group of the primary school were 119.80 cm., 19.75 kg., 52.50 cm., 55.50 cm. and 17.70 cm. respectively; while that of the group of children not participating in the school lunch programme was 115.80 cm., 18.67 kg., 43.10 cm., 55.00 cm. and 16.60 cm., respectively. The differences in height, weight, head circumference and arm girth between the two groups of children was statistically significant. The difference in chest circumference was not statistically significant.

2. The mean daily calorie and protein intake of children in school lunch programme group was 1603 and 32.2 g. respectively whereas that of the non-school lunch group was 1343 and 25.4 g. respectively. When compared with the recommended allowances of ICMR (1971) for this age group, the school lunch group had 90 per cent of the calories and all protein requirements and the non school lunch group had 75 per cent of the calories and 78 per cent of the protein requirements met.

3. The mean height and weight of the children who had participated (school lunch group) in the school lunch programme from the high school was 142.8 cm and 35.0 kg. respectively; while their counterparts in the non school lunch group was 140.6 cm. and 31.8 k.g respectively.

4. A comparison of the heights and weights of all the children in this study with that of the norms prescribed for Indian children (ICMR, 1971) indicated that the children in the school lunch group were taller and heavier when compared with the national norms whereas those

in the non school lunch group were either slightly taller and heavier or had similar pattern as that of the standard norms.

5. The mean scores obtained for mental ability by the two groups of children in the primary school were 37.78 and 32.37 for the children in the school lunch and non school lunch groups and the difference in the mental ability scores was significant at one per cent level.

6. The mean IQ obtained for the school lunch and non school lunch groups from high school were 94.85 and 90.20 respectively and the difference between the groups was statistically significant at one per cent level.

7. A positive correlation between the mental ability scores and protein intake, mental ability scores and calorie intake and mental ability scores and head circumference was obtained.

8. There were no differences in the behavioural scores for either the school lunch or non-school lunch groups when rated by the teacher, the parents and the investigator, in the class room, lunch room, at outdoor activities or at home.

9. The mean scores obtained for the various behavioural aspects like punctuality, piety, obedience, respectfulness, orderliness, cooperation, sociability, concern for others, general appearance, cleanliness, leadership, emotion and tolerance for the school lunch group was higher than that of the non school lunch group and the differences were statistically significant.

10. There was a significantly positive association between the behavioural scores and educatio-nal level of the head of the family, type of family and birth order of the children in the school lunch group and no association between the behavioural scores of the non-school lunch group and the above factors. Income levels of the families did not have any association with the behavioural scores of children in both the groups.

11. Majority of the parents considered school lunch to be health promoting, nutritious, giving better scope and facility for the children to perform better in classes, facilitating school attendance, and offering scope for better behavioural development.

A well organized school lunch programme thus possesses the potentials of improving the physical, mental and behavioural aspects of children. When properly planned and organised, the school lunch offers immense scope to bring out the best in the growing generation. It provides one of the easiest and practicable vehicle synthesising the best in human culture and promoting the allround development of the young generation. The results of this investigation convincingly provide scope to propose a well organized school lunch as a strong strategy for the allround development of the children - shaping their physical, mental and behavioural developments.

Further research along these lines including a wider section of the population with varied socio-economic background and participation in differently organized school lunch programmes are recommended.

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APPENDICES

APPENDIX I

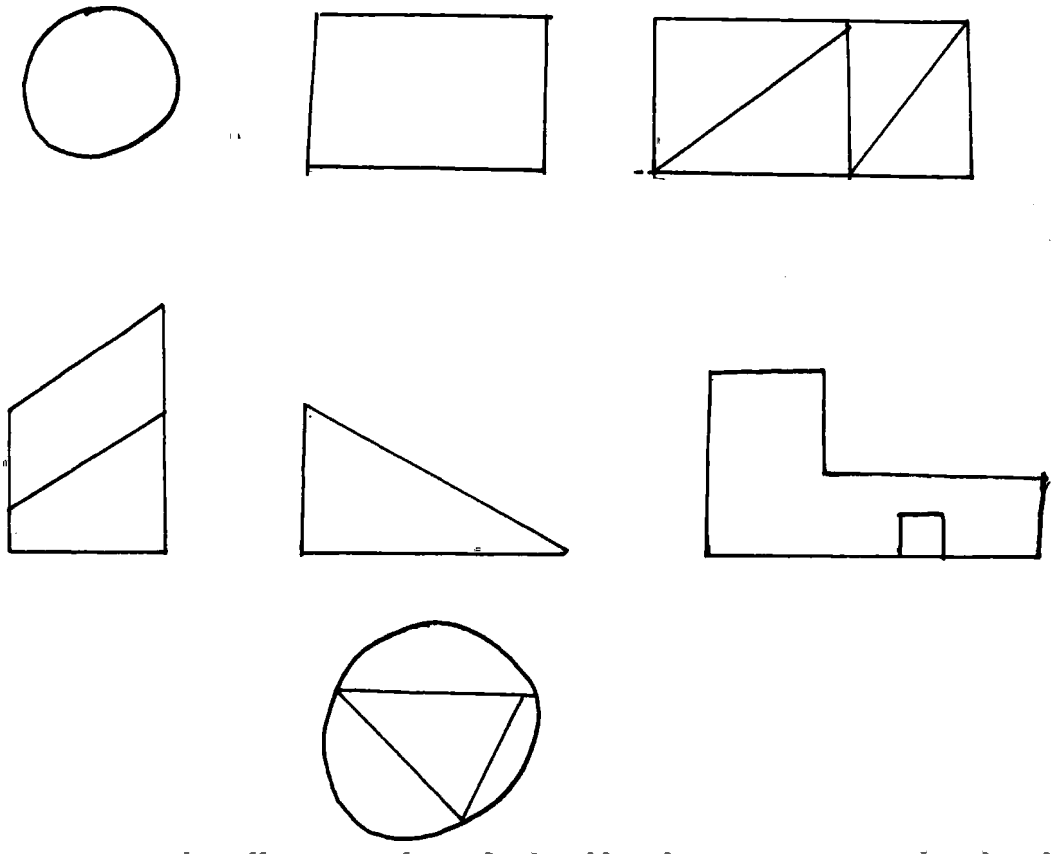
MENTAL ABILITY TEST FOR 5-10 YEAR OLD CHILDREN

I. Verbal Test:

The verbal test measured the communication of the child. The series of questions asked were as follows:

	Questions	Score
1.	What is your name?	1
2.	What is your Father's name?	1
3.	What is your father?	1
4.	Where do you live?	1
5.	What do you do when you are alone?	1

II. Pattern Drawing:



III. Information Test:

Questions	Answers	Score
The child would be instructed to listen to the question of the Investigator and answer them.		
Answer the following:		
1. The direction in which the sun rise	East	1
2. Colours we see in the National Flag?	Red, White, Green	1
3. Sugar is produced from	Sugar-cane	1
4. The number of 25 paises in a five rupee note	Twenty	1
5. The substance from which the Groundnut oil is prepared?	Groundnut	1

IV. Matching the cards:

Certain pictures would be placed in front of the child and he will be asked to match the cards in terms of relationship.

1.	Needle	- Forest	Thread	1
2	Tiger	- River	Forest	1
3	Boat	- Thread	River	1
4	Water	- Chalk	Fish	1
5	Bee	- Fish	Honey - Comb	1
6	Board	- Honey-Comb	Chalk	1
7	Skirt	- Key	Blouse	1
8	Lock	- Blouse	Key	1

Questions	Answers	Score

V. Sentence completion test:-

The child will be told that there are a few sentences. In each of the sentences there is a missing word. He/she will be asked to read the sentence and state the suitable word which would fit in the sentence.

1.	Crow is --------- in colour	Black	1
2.	Wool is prepared from ------	Goat	1
3.	------ appears in the sky in the morning?	Sun	1
4.	Dog-------the house?	Guards	1
5.	Peacocks have got-----	feathers	1

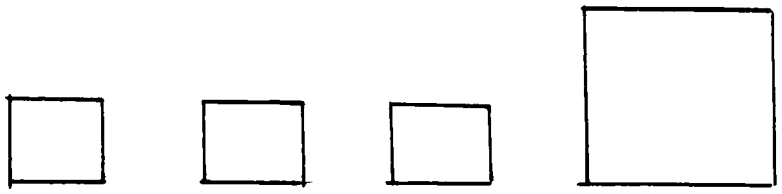
VI. Vocabulary:- (Only for 8-10 years)

Comprehension:

The child will be interested to observe the pictures showed and he will be asked to explain them pictures with two sentences

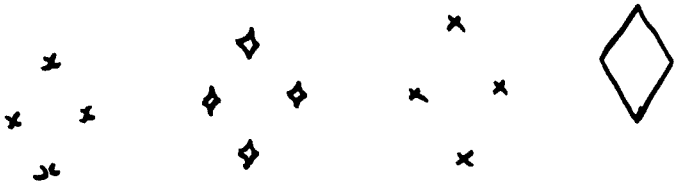
a.	Police station	1
b.	Well digger	1
c.	Mother	1
d.	Teacher	1
e.	Train	1

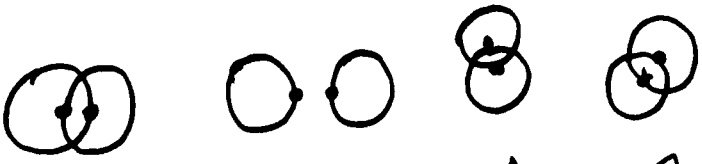
Questions	Answers	Score
VII. Identifying objects by use:		
Examples - cup = plate, mirror vessel or saucer	Plate	1
1. Brush - Paste, Comb, Soap	Paste	1
2. Boots - Socks, stick, needle	Socks	1
3. Ink bottle - book, pen, box	Pen	1
4. Skirt - Boys, Lady, girls, gentlemen	Girls	1
5. Stead - Eye, ear, nose, finger	Ear	1
VIII Arithmatical reasoning:		
The child will be asked to denote the number given below and call out the relevant number for filling the gaps (only for 8-10 years)		
1. 2 x 110 --------	220	1
2. 25 - 2 ---------	23	1
3. 1000 x --------- = 6000	6	1
4. -------- x 16 = 256	16	1
5. ---------x ------- 0	0	1
IX Draw a man's test:		
The child will be asked to draw a figure of a person Marks will be allotted for each parts of the body.		
Face		2
Hands		1
Legs		1
Body		1
X Find out the following:		
Three of the four designs are alike which one is not like the other three		
	Score	10

1. 

2. 

3. 

4. 

5. 

6. 

7. 

8. Candle Lamp Agal vilakku Bulb.

9. Powder Hair oil Snow Sweets.

10. Pen pencil chalk. Box.

APPENDIX II

OTIS QUICK - SCORING MENTAL ABILITY TESTS FOR 10 - 15 YEAR OLD CHILDREN(BETA FORM)

Name:- ..... Age:- ..... Class:-.....

Birthday:- .....

This is a test to see how well you can think. It contains questions of different kinds. Here is a sample question already answered correctly. Notice how the question is answered.

Sample:

1. Which one of the five things below is soft:

1.Glass 2. Stone, 3. Cotton, 4. Iron, 5. ICE

The right answer, of course is cotton: so the word cotton is underlined. Try this sample question yourself

Do not write the answers:

Sample: No.2

A robin is a kind of - (1) Plant, (2) Lived, (3) Worm, (4) Fish (5) flower

The answer is bird, so you should have drawn a line under the word bird.

Sample: No. 3

Which one of the five numbers below is larger than 55?

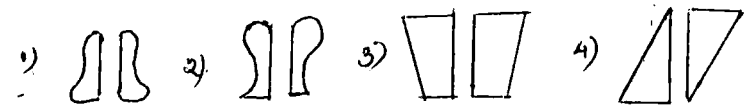
(1) 53,(2 48, (3) 29, (4) 57, (5) 16

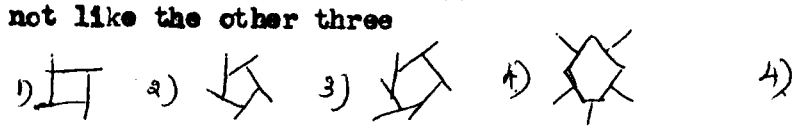
The answer, ofcourse is 57; so you should have drawn a line under 57.

The test contains 80 questions. You are not expected to be able to answer all of them, but do the best you can. You will be allowed half an hour after the examiner tells you to begin. Try to get as many right as possible. Be careful not to go so fast that you make mistakes. Do not spend too much time on any question. Be careful not to go so fast that No questions about the test will be answered by the examiner after the test begins.

No.	Question	Answer	Score
1.	Which one of the five things below doest not belong with the others? 1.Potato, 2. turnip, 3, carrot 4. stone, 5. onion	4.stone	1
2.	Which one of the five answers below tells best what a sword is? 1. to cut, 2. a weapon, 3. an officer 4. a tool, 5. to fight	2. a weapon	1
3.	Which one of the five words below means the opposite to north? 1. east, 2. star, 3. south,4. pole 5. equator	5. South	1
4.	The skin is to a banana and the husk is to a chest nut as a shell is to what? 1. An apple,2. an egg, 3. Juice 4. a peach, 5. a hen	2.an egg	1
5.	A child who knows he is guilty of doing wrong should feel 1. lead, 2. sick, 3. better 4. afraid, 5. ashamed	5. ashamed	1

No.	Question	Answer	Score
6.	Which one of the five things below is the largest? 1) knee 2) toe 3) leg 4)ankle 5) foot	3) leg	1
7.	Which one of the five words means the opposite of strong 1) man 2) weak 3) small 4) short 5) thin	2) weak	1
8.	Three of the four design on the right are alike. Which one is not like the other three? 1)  2)  3)  4) 	(3)	
9.	Which one of the five things below is most like these three; a chair; a bed; and a stove? 1) a chimney 2) a stick 3) a window 4) a table 5) a floor	4) a table	1
10.	A knee is to a leg as an elbow is to what? 1. an arm. 2. a shoulder 3. a bone 4. a wrist 5. a hand	1. an arm	1
11.	Which word means the opposite of Joy? 1. Sickness 2. Bad 3. happiness 4. Sorrow 5. cry	4. sorrow	1
12.	If I find a kind of plant that was never seen before I have made 1. an invention 2. an adoption 3. a creation 4. a novelty 5. a discovery	5. a discovery	1

No.	Question	Answer	Score
13.	A sculptor is to a statue as an author is to a 1. Book 2. man 3. name 4. book-case 5. pen	1. Book	1
14.	At 3 pence each, how many pencils can be brought for 27 pence? 1. 27 2. 81 3. 3 4. 9 5. 30	4. 9	1
15.	Three of the four designs on the right are like which one is not like the other three? 		
16.	Which is the most important reason that words in the dictionary are arranged alphabetically? 1. It is the simplest arrangement 2. It puts the shortest words first 3. It enables us to find any word quickly 4. It is merely a custom 5. It makes the printing easier	3. It enables us to find any word quickly	1
17.	Which one of the five things below is most like these three; a saw, a hammer and file? 1. a bottle, 2. a pen, 3 a screw driver 4. a fork, 5. a corpet	3. a screw-driver	1
18.	If the following words were arranged in order which word would be in the middle? 1. lunch, 2. dress, 3. undress, 4. supper 5. breakfast	1. Lunch	1
19.	The saying, "Don't count your chickens before they are hatched", means- 1. Don't be in hurry, 2. Don't gamble 3. Haste makes waste 5. Don't raise chickens. 4. Don't be too sure of the future.	2. 4. Don't be too sure of the future	1

No.	Question	Answer	Score
20.	Three of the four designs on the right are alike. Which one is not like the other three  		
21.	A boy who often tells big stories about what he can do is said to 1. lie, 2.fake, 3. cheat, 4. joke 5. brag	5.brag	1
22.	Which tells best what a coet is? 1. an animal with hoofs 2. an awkward little beast 3. an animal that runs fast 4. a young horse 5. a little animal that eats hay	4. a young horse	1
23.	Which of the five things below is most like these three; a horse, a pigeon, and a cricket 1.a stall, 2. a saddle 3. a feather 4. a goat 5. a wing	4. goat	1
24.	Railway- lines are to a locomotive as what is to a motor car? 1. Tyres, 2. Steam 3. Speed 4. the road 5. pretty	4. the road	1
25.	Which word means the opposite of pretty? 1. Good, 2. ugly, 3. bad, 4. crooked, 5. nice	2. ugly	1
26.	Which one of the words below would come first in the dictionary? 1. tramp, 2. saint, 3. razor, 4. quart, 5. grass	5. grass	1

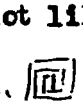
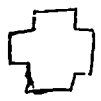
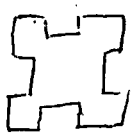
No.	Question	Answer	Score
27.	Bread is to man as hay is to what? 1. wheat 2. a barn 3. grass 4. a horse, 5.flour	4. a horse	1
28.	Which tells best what a cup is? 1. a small drinking-vessel 2. something to hold coffee 3. a thin breakable object, 4. it is used on a table 5. it has a handle	1. a small drinking vessel	1
29.	Which of these series contains a wrong number? 1) 3-6-9-12-15 2) 2-5-8-11-14 3) 1-4-7-10-12 4) 2-4-6-8-10 5) 1-3-5-7-9	3) 1-4-7-10-12	1
30.	Which one of the five things below is most like these three: a ship a bicycle, and a truck? 1. a sail, 2. a wheel 3. a train 4. the ocean, 4. a tyre	3. a train x.	1
31.	Which statement tells best just what a corridor is? 1. a small room 2) a place to hand your hat and coat 3) it is long and narrow 4) where to say good buy 5) a passage leading from one room to another	5. a passage reading from one room to another	1
32.	Steam is to water as water is to 1) hot 2) ice 3) and engine 4) a solid 5) gas	2) ice	1
33.	Which one of these words would come last in the dictionary? 1) health 2) juggle 3) normal 4) newer 5) grateful	3) Normal	1

No.	Question	Answer	Score
34.	If George is taller than Frank and Frank is taller than James, then George is (?) James 1) Taller than 2) Shorter than 3) just as tall as 4) cannot say which	1. Taller than	
35.	A man who betrays his country is called a 1) thief 2) trailer 3) enemy 4) coward 5) slacker	2. trailer	1
36.	Count each 7 below that has a 5 next after it 7 5 3 0 9 7 3 5 8 7 7 4 2 1 7 5 7 3 2 4 7 0 9 3 7 5 5 7 2 5 7 1 5 4 7 1 How may such 7's did you count? 1) 11 2) 2 3) 3 4) 4 5) 12	4) 4	1
37.	The daughter of my mother's brother is my 1) sister 2) niece 3) cousin 4) aunt 5) grand daughter	3) cousin	1
38.	Peace is to war as (?) is to confusion 1. explosion 2) order 3) armistice 4) riot 5) police	2) order	1
39.	If Neela is older than Kumutha and Neela is younger than Mala, than Mala is (?) Kumutha 1) Older than 2) Younger than 3) just as old as 4) cannot my which	1) Older than	1
40.	If the following words were arranged in order, with what letter would the middle word begin? Week year hour second day month minute 1.W 2 S 3.H 4. D 5. M	4. D.	1

No.	Question	Answer	Score
41.	A quantity which grows larger is said to 1. Prosper 2. increase 3. flaten 4. rise 5. burst	2. increse	1
42.	One number is wrong in the following series. What should that number be? 7 1 7 2 7 3 7 4 7 5 7 6 7 8 1) 6 2) 7 3) 8 4) 4 5) 5	2) 7	1
43.	Which of the five things below is most like these three: 1 a tent, a flag and s_ail? 1. a shoe, 2. a ship 3. a staff 4. a towel 5. a rope	4) a towel	1
44.	What is the most important reason that we use clocks? 1) to wake us up in the morning 2) to help us catch trains 3) to regulate our daily lives 4) they are ornamental 5) so that children will get to school on time	3) to regulate our daily lives	1
45.	If the following words were rearranged to make a good sentence with what letter would the third word of the sentence begin? Houses stone built of men wood 1. h 2. s 3. b 4. m 5. W	1) h	1
46.	Which one of the words below would come last in the following dictionery? 1) alike, 2) amount, 3) across 4) after 5) amuse	5) amuse	1
47.	Son is to daughter as uncle is to 1) mother 2) aunt 3) relation 4) woman 5) sister	2) aunt	1

No.	Question	Answer	Score
48.	A lamp is to a light as (?) is to a breeze a) a fan b) bright c) a yacht d) a window e) blow	1. a fan	1
49.	If the following words were arranged in order, which word would be in the middle? 1) good 2) excellent 3) wretched 4) fair 5) poor	5. poor	1
50.	If Henry is taller than Tom and Henry is shorter than George is (?) tom 1) taller than 2) shorter than 3) Just as tall as 4) cannot say which----	1) taller than	1
51.	A king is to a kingdom as a president is to a what? 1. queen, 2. Vice-President 3. senate 4. Republic 5. democrat	4. republic	1
52.	John is the fifth child from each end of a row. How many pupils are there in a row? 1. ten 2. eleven. 3. seven 4. nine 5. five	4. nine	1
53.	Which tells best what a motor-car is? 1) a thing with tyres 2) something to travel in 3) an engine mounted on wheels 4) a horseless carriage 5) a vehicle propelled by an engine	5. a vehicel propelled by an engine 4. nine	1
54.	Large is to object as loud is to what? 1. soft 2. small 3. heavy 4. weight 5. sound	5. sound	1

No.	Question	Answer	Score
55.	A wire is to electricity as (?) is to gas 1. a flame 2. a spark 3. hot 4. a pipe 5. a stove	4. a pipe	1
56.	An object as institution that is designed to last only a short time is said to be - 1. temporary 2. changeable 3. unsound 4. worthless 5. unstable	1. temporary	1
57.	Which word means the opposite of humility? 1. joy 2. pride 3. dry 4.funny 5. recklessness	1. pride	1
58.	A word that means suitable fit, or proper is - 1. grotesque 2. odd 3. inadequate 4. superfluous 5. appropriate	5. appropriate	1
59.	If the words below were rearranged to make a good sentence, the third word of the sentence would beginning with what letter men high the a wall built stone. 1. m 2. b 3. h 4. w 5. s	2. b	1
60.	Three of the four designs on the right are alike. Which one is not like the other three		
61.	There is a saying,"Any port in a storm". This means, 1. ships should not venture out of sea in storms. 2) stormy weather causes large waves in harbours 3) in emergencies any aid is acceptable 4) ships usually sink in strems...	3. In emergencies any aid is acceptable	1

No.	Question	Answer	Score
62.	Which one of the five things below is most like these three; cannon-ball, wire and penny? 1. pound note 2. bone 3. string 4. pencil 5. key	5. key	1
63.	Three of the four designs on the right are alike. Which one is not like the other three? 1.  2.  3.  4)  4)		
64.	There is a saying, "Don't look a gift horse in the mouth". This means 2. It is not safe to look into the mouth of a horse 2.you cannot judge the age of a gift house by his teeth. 3. don't accept a horse as a gift, accept it graciously 4. Although you question the value of the gift, accept it graciously	4. although the question the value of a gift accept it graciously	1
65.	A boy is to a man as (?) is to a sheep 1. wool 2.a lamb 3. a goat 4. shephere 5. dog	2. a lamb	1
66.	If the following words were arranged to make a good sentence with what letter would the last word of the sentence begin? Usually made tables wood 1. w 2. d 4. t 3. a 5. m	1 W.	
67.	An agreement reached in which both sides yield somewhat in their demands is called 1. a promise 2. a compromise 3. an understanding 4. a dead lock 5.an armistice	2. a compromise	1
68.	Three of the four designs at the right are alike. Which one is not like the other three? 1  2.  3.  4) 		

No.	Question	Answere	Score
69.	What is the latter that follows the letter that comes next after M in the alphabet 1. L 2. m 3. n 4. o 5. p	4. o	1
70.	One number is wrong in the following series 1, 2, 4, 8, 24, 32, 64 what should that number be? 1. 6, 2. 12 3. 3. 4. 16, 5. 48	4. 16	1
71.	If I have a large box with two small boxes in it and five were very small boxes in each small box how many boxes are there in all? 1. eight, 2. seven. 3. ten. 4 twelve 5. thirteen 5.	5. thirteen	1
72.	There is a saying, "An ounce of practice in worth a pound of preaching". This means - 1. don't preach 2. deeds count more than words 3. preaching takes practice 4. don't practise	2. deeds count more than words	1
73.	If a photograph that is 2 inches wide and 3 inches long is enlarged to be 10 inches wide how many inches long will it be? 1) 11 2) 12 3) 15 4) 20 5) 30	3) 15	1
74.	One number is wrong in this series 1 2 4 5 7 8 10 11 12 14 what should that number be? 1) 9 2) 6 3) 3 4) 13 5) 16	4) 13	1
75.	When the time by a clock was 8 minutes past 10, the hands were interchanged. The clock then said about 1) 10 min past 8 2) 8 min. past 10 3) 8 min. to 2 4) 8 min. to 10 5) 8 min past 2	4) 8 min. to 2	1

No.	Question	Answer	Score
76.	A car-owner uses a mixture in his radiator containing 1 quart alcohol to every 2 quarts of water. How many quart of alcohol are needed for 15 quarts of the mixture? 1. $7\frac{1}{2}$ 2. $\frac{1}{2}$ 3. 14 4. 30 5. 5	5) 5	1
77.	What letter in the following series appears a third time nearest the beginning? A E C B A D D E C F B C D A E E B D 1) A 2) B 3) C 4) D 5) E	3) C	1
78.	In a foreign language Pira numa bega means very deep snow: pira seco means white snow: numa copa means very well. What word means deep? 1. peya, 2. numa. 3. bega 4. copa 5. seco	3) bega	1
79.	Which of the five words below does not belong with the others? 1. brave 2. clever 3. honest 4. generous 5. loyal	2) clever	1
80.	A boy is now three as old as his sister. In a 4 years he will be only twice as old. How many years old is his sister. 1) 1 2) 2, 3) 3, 4) 4, 5) 5.	4) 4	1

APPENDIX III

COMPUTATION OF IQ

Formerly Development Specialist with Advisory Board. General Staff. United States War, Department. "OTIS QUICKSCORING MENTAL ABILITY TESTS".

The Otis quick-scoring tests of Mental Ability comprise three tests, called - Alpha, Beta and Gamma. The three tests are designed for ages as follows:

Alpha	test	.. ages 7 - 10
Beta	test	.. ages 10 - 15
Gamma	test	.. ages 15 - 18

HOW TO FIND A PUPIL'S 'IQ' BY THE BETA TEST:

To find a pupil's 'IQ' from his score in the Beta test proceed as follows:

1. Find the norms for the pupil's age from the given table
2. Find the amount by which the pupils score exceeds (or falls below) the norm for her age call this her "deviation of score".
3. Add the pupil's deviation of score to 100 (or subsctract from 100 if the deviation is downward)

the result is the pupils 'IQ'

This method is recommended as yielding measures of brightness that are more consistant and constant for a given individual than ordinary IQ's.

AGE NORMS FOR BETA :- FORM A AND B

Months	Years									
	8	9	10	11	12	13	14	15	16	17
0	7	15	23	31	38	44	49	53	56	58
1	8	16	24	32	39	44	49	53	56	58
2	8	16	24	32	39	45	50	53	56	58
3	9	17	25	33	40	45	50	54	57	58
4	10	18	26	34	40	46	50	54	57	58
5	10	18	26	34	41	46	51	54	57	58
6	11	19	27	35	41	46	51	55	57	59
7	12	20	28	35	42	47	51	55	57	59
8	12	20	28	36	42	47	52	55	58	59
9	13	21	29	36	43	48	52	55	58	59
10	14	22	30	37	43	48	52	56	58	59
11	14	22	30	37	43	49	53	56	58	59

APPENDIX IV

SRI AVINASHILINGAM HOME SCIENCE COLLEGE FOR WOMEN
COIMBATORE-641011

PROFORMA TO ELICIT THE FAMILY BACKGROUND, BEHAVIORAL PATTERN, ATTITUDES OF PARENTS OF CHILDREN PARTICIPATING AND NOT PARTICIPATING IN THE SCHOOL LUNCH PROGRAMME.

PART - 'A'

FAMILY BACKGROUND

1. Name of the child :

   Class :

2. Name of the head of the family :

   Address :

Type of the family:

Nuclear ☐

Joint ☐

3. Composition of the family:

(a)

S. No.	Name of the family members	Relationship to the head of the family	Sex	Age	Educational level	Occupation	Income per month
1.							
2.							
3.							
4.							
5.							
6.							

(b) Income from other sources:-

(c) Total family income:-

PART - B

BEHAVIOUR PATTERN OF THE CHILDREN

Type of Behaviour	Score	Situation in which conducted							
		In Class room		In dinning room at lunch		Outside the class during extra and co-curricular activities		At home	
		I		II		III		IV	
		T	I	T	I	T	I	Parents	
1. PUNCTUALITY:									
a. Being in time for school and regular in attendance	5								
b. 75% of the time regular in attendance and punctual	4								
c. 50% of the time regular in attendance and punctual	3								
d. 25% of the time regular in attendance and punctual	2								
e. Very irregular and unpredictable	1								
f. No opportunity to measure	0								
2. PIETY:									
a. Very regular for prayers and participates well in prayers	5								
b. Regular for prayers and participates without much concentration	4								
c. Regular for prayers but does not concentrate in prayers	3								

Contd.....

Type of behaviour	Score	I		II		III		IV
		T	I	T	I	T	I	Parents
d. Irregular for prayers and no participation	2							
e. Very irregular	1							
f. No oppertunity to observe	0							
3. OBEDIENCE								
a. Always obedient to teachers and all other elders	5							
b. Obedient only to the teachers/ parents	4							
c. Obedient at time	3							
d. Obedient to selective members only	2							
e. Never obedient	1							
f. No opportunity to observe	0							
4. ORDERLINESS:								
a. Sitting straight in the correct posture with full concentration	5							
b. Sitting in position but less concentration	4							
c. Disorderliness	3							
d. Walking around and talking too much in the class	2							
e. Restlessness	1							
f. No opportunity to observe	0							
5. RESPECTFULNESS:								
a. Readily gets up and wishes teachers and all elders	5							
b. Slow response in showing respect to teachers/parents.	4							

T. = Scoring by the teacher
I. = Scoring by Investigator

Contd.....

Type of behaviour	Score	I		II		III		IV
		T	I	T	I	T	I	Parents
c. Giving respect only to related people	3							
d. Rarely responds in giving respect	2							
e. Never concerned about respecting people	1							
f. No opportunity to observe	0							
6. CO-OPERATION								
a. Very co-operative with teachers/ parents, classmates/sibilings and peer group	5							
b. Co-operative with teachers/ parents only	4							
c. Co-operative with classmates/ siblings and peer group only	3							
d. Co-operative only with selected few	2							
e. Non-Co-operative and indifferent	1							
f. No opportunity to observe	0							
7. SOCIABILITY:								
a. Converses freely with parents, teachers, classmates and strangers	5							
b. Converses freely with teachers/ parents and classmates/sibling only	4							
1								
c. Converses freely with classmates/ sibilings only	3							
d. Converses only with selected few	2							
e. Does not indulging in socialisation	1							
f. No opportunity to observe	0							

T = Scoring by the teacher
I = Scoring by the investigator

Contd.....

Type of behaviour	Score	I		II		III		IV
		T	I	T	I	T	I	Parents
8. CONCERN FOR OTHERS:								
a. Selfless help and concern for all	5							
b. Very helful when situation calls for	4							
c. Helpful only to selected people	3							
d. Rarely helful to any	2							
e. Never raises up to any occasion	1							
f. No opportunity to observe	0							
9. A. GENERAL APPEARANCE:								
a. Well groomed and neat	5							
b. Fairly wellgroomed and neat	4							
c. Occasioanlly wellgroomed and neat	3							
d. Seldom wellgroomed	2							
e. Very shabby	1							
f. No opportunity to observe	0							
B. CLEANLINESS:								
a. Clean habits of keeping books and other possession including the classroom	5							
b. Takes care of one's own possession and not concerned about the sorroundings	4							
c. Occasioanlly keeps the possession and sorroundings clean	3							
d. Very rarely keeps the possession and sorroundings clean	2							
e. Never keeps things clean	1							
f. No opportunity to observe	0							

T = Scoring by the Teacher
I = Scoring by the investigator

Contd.....

Type of behaviour	Score	I		II		III		IV
		T	I	T	I	T	I	Parents
10. LEADERSHIP								
a. Readily and spontaneously accepts responsibility	5							
b. Accept responsibilities when the situation demands	4							
c. Interested in taking up responsibility and not competent to carryout	3							
d. Seldom takes up any responsibility	2							
e. Never takes up any responsibility	1							
f. No opportunity to observe	0							
11. EMOTIONS:								
a. Always calm and takes things at ease and is clear in action	5							
b. Takes things calmly but not capable of making correct decissions	4							
c. Takes things with great anxiety and worry	3							
d. Taking things too seriously to heart or violent reactions	2							
e. Always easily burstout	1							
f. No oppertunity to observe	0							
12. TOLERANCE:								
a. Easily adjustable and puts up with all people under all circumstances	5							
b. Adjust well with teachers/ parents (only)	4							
c. Adjust and tolerate the leader only but not other classmates/ siblings	3							
d. Adjust only with selected few	2							
e. Unadjustable	1							
f. No opportunity to observe	0							

PART - C

PARENTS ATTITUDES TOWARDS SCHOOL LUNCH

1. Is your child participating in the school lunch programme if so, give reasons.

   1.

   2.

   3.

2. What are the advantages and disadvantages gained by the child's participation in the school lunch programme?

Advantages	Reason	Disadvantages	Reason

3. Mention the specific behavioural changes in your child due to his/her participation in school lunch programme.

Changes	Extent of changes	
	Fully	Partially

4. Mention the specific changes in the eating habits of your child due to the participation in the school lunch programme.

Changes	Extent of change	
	Fully	Partially

5. Mention the specific changes, if any, in the health of your child, because of his/her participation in the school lunch programme.

Changes:

1.

2.

3.

6. Mention any observable change in food habits or knowledge about foods in your family as a result of your child's participation in the school lunch programme.

Changes	Reasons for changing

7. Do you have any specific suggestion for improving the present school luch programme.

Suggestion for improvement	Reasons

APPENDIX - V

ANTHROPOMETRIC MEASUREMENTS OF PRIMARY SCHOOL CHILDREN

SCHOOL LUNCH GROUP

S.No.	Hight in cm.	Weight in kg.	Head circumference in cm.	Chest circumference in cm.	Arm girth in cm.
1.	102.8	14.70	46	49	16
2.	99.2	14.00	48	50	16
3.	97.2	12.90	49	50	17
4.	98.0	13.00	48	55	18
5.	107.0	16.20	51	57	18
6.	108.0	16.70	47	50	18
7,	109.0	14.15	50	55	18
8.	108.6	15.75	50	52	17
9.	106.8	16.95	50	54	16
10.	110.4	16.40	47	47	18
11.	98.2	11.15	51	56	16
12.	117.9	19.70	48	51	15.5
13.	106.7	14.30	49	50	16
14.	109.8	15.75	49	50	16
15.	110.8	16.65	47	56.5	18
16.	112.0	18.90	53	57	17
17.	106.2	14.90	49	53	16
18.	100.5	13.20	51	51	14
19.	107.2	14.30	52	50	15.15
20.	109.3	18.00	48	56.5	19
21.	106.4	15.00	49	51	17
22.	112.2	18.10	51	56	18

Contd.....

S.No.	Height in cm.	Weight in kg.	Head circum-ference in cm.	Chest circum-ference in cm.	Arm girth in cm.
25.	107.6	13.80	48	50	14.5
24.	107.0	15.70	41	51	18
25.	116.4	19.80	51	55	17
26.	107.7	15.20	49	55	17
27.	102.7	14.65	48	53	16
28.	129.3	22.25	51	52	17
29.	109.5	17.60	50	58	18
30.	109.5	17.00	50	55	17
31.	106.8	17-90	52.5	58	20
32.	108.2	16.40	58.5	54	16
33.	107.2	15.85	49	51	17
34.	113.0	17.80	47	54	20
35.	120.0	19.70	48	57	20
36.	117.3	19.90	51	56	17
37.	117.0	18.75	47	56	19
38.	117.8	16.30	50	51	16
39.	111.3	17.50	49	54	19
40.	113.8	15.30	49.5	52.5	15.5
41.	123.0	20.40	49.5	57	19.5
42.	124.5	22.70	51	58	18
43.	128.1	24.25	53	59.5	20
44.	115.1	17.15	49	52	21
45.	116.6	20.10	50	58	20
46.	111.1	17.60	54	55	17
47.	123.9	20.45	48	57	17

Contd.....

S.No.	Height in cm.	Weight in kg.	Head circumference in cm.	Chest circumference in cm.	Arm girth in cm.
48.	118.8	18.05	51	54	16
49.	122.0	21.50	50	55	18
50.	112.0	16.10	50	52	17
51.	115.4	18.70	50	51	15
52.	116.5	18.80	51	54	18
53.	130.0	22.40	51	60	17
54.	115.5	17.75	48	56	17
55.	115.5	16.40	49	52	16
56.	132.8	23.55	52	61	19
57.	125.9	21.80	51	59	18
58.	138.2	30.85	49	51	18
59.	125.5	21.90	52	56	20
60.	119.2	20.55	51	60	17
61.	128.2	24.50	48	58	17
62.	104.9	25.85	52	60	19
63.	114.8	16.95	51	60	20
64.	129.1	25.35	51	51	16
65.	115.8	17.45	50	61	20
66.	133.0	24.55	49	52	16
67.	12 8.4	18.65	53	62	20
68.	133.2	24.40	49	55	17
69.	122.5	19.60	52	52	18
70.	135.6	24.80	51	61	18

Contd.....

S.No.	Height in cm.	Weight in kg.	Head circumference in cm.	Chest circumference in cm.	Arm girth in cm.
71.	121.8	20.00	50	55	17
72.	120.0	19.10	52	58	18
73.	118.3	25.75	51	63	18
74.	126.8	22.40	52	60	19
75.	120.4	19.00	51	62	19
76.	126.5	19.65	50	60	19
77.	108.8	15.90	50	60	18
78.	125.3	22.80	48	51	14
79.	121.6	23.05	48	59	19
80.	153.1	24.80	49	40	19
81.	122.6	21.65	51	60	19
82.	119.5	19.65	49	56	18
83.	112.6	17.25	50	59	17
84.	126.7	21.75	50	60	18
85.	118.7	19.65	50	62	19
86.	130.0	25.80	51	61	19
87.	151.2	24.10	52	60	19.5
88.	121.1	21.15	51	59	17
89.	126.1	23.65	52	57	18
90.	134.6	25.75	53	65	22

S.No.	Height in cm.	Weight in kg.	Head circumference in cm.	Chest circumference in cm.	Arm girth in cm.
91.	108.2	16.40	53	59	20
92.	125.2	23.10	51	64	19
93.	135.4	28.25	49	60	20
94.	130.4	24.65	51	51	15
96.	124.4	19.25	51	54	16
96.	130.1	23.30	53	56	17
97.	134.6	24.75	53	62	17
98.	140.3	29.30	51	61	19
99.	116.0	18.25	50	53	16
100.	123.5	21.45	50	51	18
101.	129.1	21.35	53	54	17
102.	127.6	23.80	50	60	19
103.	133.0	23.80	51	56	18
104.	129.0	23.50	50	52	18
105.	121.9	20.65	52	56	18
106.	127.2	22.45	53	54	17
107.	135.4	28.25	49	62	20

NON-SURGICAL LUNCH GROUP

S.No.	Height in cm.	Weight in kg.	Head circumference in cm.	Chest circumference in cm.	Arm girth in cm.
I	II	III	IV	V	VI
1.	105.0	16.50	49	57	17
2.	109.8	15.60	50	53	18
3.	115.6	18.80	50	56	17
4.	103.6	14.50	51	55	18
5.	121.2	19.60	49	57	17
6.	105.2	14.10	52	52	16
7.	99.5	13.60	45	47	15
8.	113.0	15.55	48	49	16
9.	101.2	14.60	41	42	14
10.	99.2	13.80	47	51	16
11.	104.0	16.80	51	54	18
12.	106.7	15.85	50	54	16
13.	105.7	14.75	48	54	16
14	110.4	16.10	41	44	16
15.	109.0	16.40	50	56	17
16.	105.0	14.75	49	58	17
17.	109.7	15.30	50	58	18
18.	106.8	14.30	47	49	16

I	II	III	IV	V	VI
19	110.7	15.20	51	52	17.5
20.	107.4	16.40	49.5	56	18
21.	106.4	15.0	48	50	15
22.	106.2	14.3	48	51	15
23.	100.4	13.20	49	55	16
24.	111.4	17.25	51	52	16
25.	106.0	15.30	50	54	16
26	125.8	21.00	53	56	19
27	119.0	18.45	51	54	18
28.	111.2	14.80	47	50	18
29.	112.7	17.60	47	51	17
30.	109.5	17.00	46	50	18
31.	119.5	18.00	48	56	17
32	108.0	16.25	49	55	17
33.	112.7	18.55	50	55	17
34.	108.0	16.35	49	53	18
35.	118.0	18.15	52	56	18
36.	117.8	20.20	51	57	19
37.	117.1	19.50	50	57	18
38.	117.5	18.75	49	54	18
39.	123.1	19.50	54.5	55	19
40.	122.7	22.45	52	59	17
41.	125.2	24.50	52	62	20
42.	122.5	18.50	48	53	17
43.	119.4	18.80	59.5	55	18

Conted .....

I	II	III	IV	V	VI
44	117.5	16.15	50.5	55	17
45.	130.4	21.50	49	56	19
46.	121.3	23.50	50	60	19
47.	117.0	18.85	49	53.5	17
48.	111.2	17.80	50	51.0	18.5
49.	109.8	15.40	48	59	17
50.	115.7	18,85	50	56	19
51.	117.7	19.00	50	54	18
52.	124.9	25.75	48	52	18
53.	118.2	20.00	50	52	19
54.	121.4	22.85	48	57	17
55.	119.4	21.10	49	52	17
56.	130.8	19.90	53	51	19
57.	119.4	24.80	52	66	23
58.	121.5	21.00	54	56	17
59.	123.0	12.90	49	55	17
60.	128.5	22.40	50	59	19
61.	134.5	21.75	49	50	15
62.	124.3	24.70	52	50	18
63.	121.6	21.65	49	57	19
64.	118.3	25.75	51	58	18
65.	118.4	18.70	50	57	18
66.	121.3	23.50	49	60	19
67.	121.3	23.50	51	59	18
68.	117.5	18.75	50	54	17

Contd.....

I	II	III	IV	V	VI
69	116.6	19.00	50	57	16
70	115.8	17.45	49	54	17
71.	122.5	19.60	50	58	20
72.	124.7	24.05	54	60	19
73.	121.8	20.00	49	58	18
74.	120.00	19.10	59	57	18
75.	120.0	18.80	44	56	14
76.	124.3	21.45	51	58	18
77.	125.0	19.60	51	62	19
78.	121.3	20.20	51	57	20
79.	113.4	20.00	51	56	18
80.	129.6	21.65	49	56	17
81.	137.7	27.00	49	62	20
82.	125.7	21.30	48	58	18
83.	126.7	21.00	52	55	14
84.	126.8	25.60	48	54	17
85.	123.2	20.75	50	60	17
86.	134.1	24.10	53	59	18
87.	137.6	30.20	52	59	18
88.	125.8	21.30	50	58	19
89.	122.4	23.50	50	58	19
90.	126.5	22.50	50	59	18
91.	122.3	23.50	49	56	17
92.	130.0	23.60	49	54	17
93.	126.0	19.65	47	59	18

Contd.....

I	II	III	IV	V	VI
94	127.9	24.50	50	59	18
95	115.8	20.00	51	56	16
96.	157.7	27.00	50.5	56	17
97.	118.4	24.75	52	60	18
98.	138.7	23.30	50	58	19
99.	118.5	20.40	49	58	18.5
100.	128.5	13.80	51	60	21.0
101.	138.7	18.00	52	57	17
102.	120.5	19.65	51	57	20
103.	125.6	16.20	50	58	19.5
104.	115.3	17.25	53	58	18
105	110.3	15.90	50	72	22.5
106.	108.2	15.40	52	51	18
107.	130.8	14.15	50	52	18

APPENDIX VI

ANTHROPOMETRIC MEASUREMENTS OF THE HIGH SCHOOL CHILDREN

(SCHOOL LUNCH GROUP)

S.No.	Height in cm.	Weight in kg.	S.No.	Height in cm.	Weight in kg.
1.	116.5	19.20	25.	148.1	36.50
2.	126.6	28.60	26.	146.2	34.60
3.	127.0	21.75	27.	150.5	36.60
4.	139.5	29.00	28.	142.0	40.00
5.	131.1	21.00	29.	134.1	28.00
6.	139.0	25.75	30.	145.0	43.00
7.	139.2	29.90	31.	140.9	29.00
8.	130.0	26.00	32.	156.5	37.20
9.	135.0	28.85	33.	154.0	43.30
10.	135.7	25.00	34.	151.0	50.50
11.	141.5	26.90	35.	148.6	33.80
12.	138.0	32.60	36.	154.0	44.00
13.	136.0	28.70	37.	147.5	35.90
14.	140.4	32.00	38.	156.5	37.20
15.	145.0	31.00	39.	150.00	48.70
16.	140.3	32.50	40.	148.0	35.00
17.	133.2	25.00	41.	157.0	41.00
18.	152.8	42.00	42.	160.0	39.00
19.	140.9	33.00	43.	138.5	31.00
20.	142.0	40.80	44.	147.7	41.20
21.	134.1	29.50	45.	149.1	30.90
22.	134.5	30.50	46.	149.2	39.00
23.	145,2	42.10	47.	151.9	43.95
24.	149.2	37.00			

NON SCHOOL LUNCH GROUP

S.No.	Height in cm.	Weight in kg.	S.No.	Height in cm.	Weight in kg.
1.	122.7	20.50	24.	151.3	36.70
2.	122.5	20.00	25.	143.8	35.00
3.	137.8	26.50	26.	150.0	48.70
4.	132.0	23.10	27.	151.1	50.50
5.	139.9	25.00	28.	156.5	37.20
6.	113.3	17.75	29.	138.2	34.20
7.	140.3	29.50	30.	141.2	32.00
8.	134.0	21.45	31.	141.9	37.70
9.	128.7	25.00	32.	144.3	35.50
10.	134.0	25.00	33.	147.6	35.80
11.	145.0	31.00	34.	143.8	36.30
12.	138.0	33.80	35.	139.0	35.60
13.	140.0	32.00	36.	147.6	38.50
14.	134.7	30.70	37.	145.7	33.10
15.	135.2	27.80	38.	142.6	41.00
16.	138.0	32.20	39.	148.0	42.30
17.	134.1	28.00	40.	145.3	36.70
18.	134.5	28.80	41.	152.5	35.50
19.	138.5	30.50	42.	148.9	37.20
20.	138.5	31.00	43.	157.0	41.20
21.	134.1	29.50	44.	146.0	30.50
22.	138.0	32.60	45.	147.7	41.50
23.	145.3	36.70	46.	142.6	37.60
24.			47.	139.2	28.70

APPENDIX VII

MENTAL ABILITY SCORES OF PRIMARY SCHOOL CHILDREN SCHOOL LUNCH GROUP

S.No.	Total Scores	S.No.	Total Scores
1	36	20	43
2	38	21	33
3	23	22	34
4	35	23	33
5	33	24	22
6	39	25	33
7	40	26	29
8	39	27	29
9	44	28	21
10	38	29	27
11	46	30	32
12	30	31	41
13	22	32	36
14	21	33	34
15	36	34	32
16	39	35	33
17	35	36	36
18	41	37	33
19	41	38	37

MENTAL ABILITY SCORE OF PRIMARY SCHOOL CHILDREN
SCHOOL LUNCH GROUP

S.No.	Total Score	S.No.	Total Score	S.No.	Total Score
39	33	60	34	81	43
40	33	61	43	82	46
41	38	62	42	83	45
42	31	63	40	84	50
43	39	64	41	85	47
44	30	65	40	86	49
45	34	66	41	87	46
46	39	67	42	88	38
47	39	68	42	89	35
48	33	69	41	90	42
49	36	70	24	91	41
50	38	71	45	92	40
51	29	72	40	93	48
52	38	73	34	94	47
53	38	74	33	95	44
54	25	75	39	96	40
55	37	76	45	97	35
56	33	77	50	98	39
57	39	78	40	99	39
58	31	79	45	100	45
59	41	80	45	101	49

S.No.	Total Score
102	45
103	42
104	32
105	37
106	37
107	35

NON SCHOOL LUNCH GROUP

S.No.	Total Score	S.No.	Total score	S.No.	Total score
1.	35	21.	9	41.	32
2.	26	22	26	42	32
3.	33	23	34	43	24
4.	24	24	39	44	29
5.	28	25	33	45	35
6.	32	26	0	46.	37
7.	33	27	36	47.	46
8.	31	28	29	48.	38
9.	34	29	33	49	39
10.	19	30	12	50	29
11.	21	31	22	51	37
12.	20	32	38	52	40
13.	32	33	43	53	46
14.	31	34	4	54	33
15.	23	35	31	55	36
16.	33	36	42	56	32
17.	29	37	32	57	44
18.	28	38	32	58	44
19.	41	39	28	59	37
20.	33	40	40	60	40

S.No.	Total score	S.No.	Total score	S.No.	Total score
61.	36	81	47	101	38
62.	37	82	49	102.	38
63.	48	83	43	103	34
64.	31	84	38	104	46
65.	36	85	49	105	37
66.	41	86	46	106	36
67.	38	87	48	107	43
68.	43	88	50		
69.	31	89	42		
70.	38	90	34		
71.	24	91	39		
72	42	92	33		
73	37	93	41		
74	44	94	36		
75	29	95	37		
76	40	96	32		
77	44	97	19		
78	41	98	43		
79	48	99	43		
80	41	100	38		

APPENDIX VIII

IQ LEVELS OF HIGH SCHOOL CHILDREN SCHOOL LUNCH GROUP

S.No.	IQ Levels	S.No.	IQ Levels
1	73	24	76
2	101	25	84
3	90	26	92
4	88	27	76
5	97	28	87
6	86	29	82
7	95	30	83
8	109	31	87
9	95	32	96
10	92	33	94
11	96	34	83
12	80	35	97
13	87	36	76
14	91	37	108
15	94	38	91
16	104	39	99
17	86	40	108
18	98	41	93
19	96	42	83
20	83	43	98
21	95	44	86
22	87	45	83
23	80	46	97
		47	94

NON SCHOOL LUNCH GROUP

S.No.	IQ Levels	S.No.	IQ Levels
1	83	25	76
2	95	26	85
3	86	27	92
4	98	28	85
5	99	29	93
6	86	30	81
7	96	31	82
8	89	32	89
9	97	33	91
10	101	34	70
11	90	35	91
12	82	36	92
13	93	37	88
14	90	38	99
15	90	39	98
16	90	40	108
17	87	41	80
18	90	42	87
19	75	43	72
20	76	44	81
21	83	45	80
22	77	47	77
23	79	47	89
24	85		

APPENDIX IX

TOTAL BEHAVICURAL SCORES. THE SCHOOL LUNCH GROUP

(Maximum Scores : 35)

S.No.	Scores	S.No.	Scores	S.No.	Scores	S.No.	Scores
1	24	23	31	45	44	67	38
2	21	24	61	46	35	68	46
3	61	25	23	47	62	69	37
4	27	26	43	48	45	70	47
5	25	27	61	49	36	71	62
6	61	28	32	50	62	72	39
7	41	29	42	51	48	73	59
8	26	30	61	52	40	74	49
9	50	31	32	43	54	75	55
10	61	32	49	54	42	76	41
11	27	33	42	55	55	77	51
12	51	34	33	56	53	78	54
13	61	35	56	57	63	79	50
14	28	36	57	58	39	80	65
15	52	37	34	59	60	81	56
16	66	38	41	60	47	82	45
17	58	39	59	61	40	83	49
18	29	40	65	62	64	84	57
19	30	41	43	63	48	85	49
20	42	42	44	64	43	86	46
21	45	43	64	65	52	87	58
22	46	44	59	66	53	88	47

S.No.	Scores	S.No.	Scores	S.No.	Scores
89	60	111	45	133	43
90	45	112	65	134	45
91	64	113	64	135	64
92	44	114	52	136	52
93	54	115	65	137	54
94	65	116	45	138	60
95	47	117	63	139	55
96	60	118	65	140	44
97	52	119	47	141	60
98	61	120	48	142	53
99	49	121	65	143	49
100	51	122	52	144	41
101	62	123	61	145	61
102	58	124	65	146	60
103	48	125	47	147	62
104	63	126	45	148	61
105	54	127	65	149	63
106	49	128	41	150	43
107	64	129	65	151	59
108	55	130	44	152	65
109	47	131	52	153	63
110	42	132	64	154	54

NON SCHOOL LUNCH GROUP

S.No.	Scores	S.No.	Scores	S.No.	Scores	S.No.	Scores
1	56	23	21	45	39	67	27
2	58	24	61	46	47	68	45
3	63	25	60	47	62	69	61
4	61	26	24	48	40	70	41
5	65	27	41	49	52	71	47
6	57	28	62	50	54	72	60
7	47	29	31	51	62	73	46
8	43	30	43	52	38	74	53
9	58	31	42	53	49	75	61
10	60	32	35	54	60	76	54
11	61	33	44	55	37	77	49
12	59	34	63	56	54	78	64
13	58	35	45	57	62	79	55
14	32	36	38	58	35	80	47
15	34	37	49	59	53	81	73
16	48	38	61	60	49	82	56
17	52	39	51	61	27	83	42
18	65	40	37	62	48	84	61
19	63	41	54	63	62	85	43
20	25	42	61	64	23	86	49
21	32	43	40	65	47	87	61
22	36	44	53	66	46	88	53

S.No.	Scores	S.No.	Scores	S.No.	Scores
89	60	111	65	133	58
90	28	112	43	134	57
91	41	113	42	135	65
92	52	114	34	136	59
93	63	115	46	137	43
94	45	116	44	138	65
95	50	117	65	139	49
96	64	118	42	140	53
97	51	119	48	141	35
98	46	120	40	142	60
99	49	121	41	143	51
100	47	122	62	144	44
101	65	123	51	145	52
102	51	124	49	146	40
103	53	125	52	147	53
104	47	126	64	148	52
105	48	127	44	149	49
106	65	128	65	150	64
107	47	129	65	151	45
108	46	130	52	152	48
109	51	131	50	153	52
110	49	132	51	154	58

CORRELATION BETWEEN MENTAL ABILITY SCORES AND HEAD CIRCUMFERENCE OF THE 5-10 YEAR OLD CHILDREN

Mental ability score	40-45	46-50	51-55	56-60	Total	Y	FYY	FYY^2	FxYxY
0-10		2/0	1/2		3	-2	-6	2	2
11-20		4/0			4	-1	-4	4	0
21-30	1/0	21/0	6/0	1	29	0	0	0	0
31-40	5	69/0	41/1		115	1	115	115	36
41-50		26/0	36/2	1	63	2	126	252	72
Total	6	122	84	2	214	-	231	383	106
x	-1	0	1	-					
Fxx	-6	0	84	78					
Fxx^2	6	0	84	90					
FxYxY	-5	0	111	106					

$$r = \frac{FxYxY - \frac{(Fxx)}{(N)}\frac{(Fyy)}{(N)}}{\frac{fxx^2}{N} - \frac{(fxx)^2}{N}\sqrt{\frac{fyy^2}{N} - \frac{(fyy^2)}{N}}}$$

$$r = \frac{\frac{106}{214} - \frac{78}{214} \times \frac{231}{214}}{\sqrt{\frac{90}{214} - \frac{(78)^2}{214}}\sqrt{\frac{383}{214} - \frac{(231)^2}{(214)}}}$$

$$r = 0.26$$

APPENDIX XI

ASSOCIATION BETWEEN THE EDUCATIONAL LEVEL OF HEAD OF THE FAMILY AND BEHAVIOURAL SCORE OF CHILDREN

Behavioural Score	No Education	Upto High School	Above High School	Total
21-40	- (1)	13 (11)	2 (2)	15
41-60	12 (8)	69 (66)	6 (13)	87
60 and abcve	2 (5)	35 (40)	15 (8)	52
	14	117	23	154

x^2 = 17.83 Significant at one per cent level

$$x^2 = \frac{(O-E)^2}{E}$$

Where O is the observed frequency

E is the Expected frequency

1.00
2.00
1.80
0.36
0.14
0.63
3.77
6.13

17.83
