

A COMPARISON OF THE WETZEL GRID
AND THE MONTANA CUMULATIVE HEALTH RECORD

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INTRODUCTION

It is presumed that health is an individual problem, even though organizations for the promotion of health on the school, city, county, state, federal and international levels are very important. Any improvement of physical, mental or emotional conditions begins with individuals who do not meet standards set up by health authorities. After twenty-five years experience in public school work the writer feels that we have sometimes given more emphasis to such things as equipment and statistics than we have to the care and observation of individual children.

Responsibility for the healthy growth of children has been left largely in the hands of teachers who have neither the time nor the tools nor the training to adequately cope with the problem. The public health personnel that are available to advise and assist teachers are spread out so thinly that their training and facilities can seldom be brought to bear on an individual child before a marked deterioration in his condition has occurred. The parent, who is most intimately associated with the child, is often too preoccupied with his work to notice slight day to day changes in the condition of the child. Until manifestations of ill health are obvious, the average parent does not secure the service of persons who are qualified and

equipped to recognize the source of the condition.

The rejection rate of draftees during World War II was appalling - over fifty percent in some states. Selective Service statistics showed that out of four million men rejected for the military service, about 700,000 had remediable defects which had not been corrected. In addition, many men were accepted for military service with defects which were corrected by army and navy doctors and dentists.

Oberteuffer, in writing about the responsibility for the poor record of Americans on the draft examinations, states that, "Failure to correct remediable defects was due to the inadequacy of correlation between school health appraisal services and home or community corrective efforts".¹ The present study is concerned not so much with correlation between appraisal services and the home or community as it is in improving the methods of appraisal.

¹Delbert Oberteuffer, School Health Education, (New York: Harper and Brothers, 1949), p. 356.

CHAPTER I

THE GRID APPROACH TO THE PROBLEM OF EVALUATING HEALTH STATUS

Those who serve in the schools of the nation must accept the major responsibility for health improvement if more than lip service is to be given to the problem. Daily application of health principles and observation of health condition are a part of classroom business. Through their training teachers have been imbued with the importance of the individual and the many facets of his life. They are dedicated to work, in all its earthy aspects. Yet the over-all picture of individual health shows that our accomplishments fall far short of our aims.

Statement of the Problem

It would be manifestly unfair to place on teachers the blame for the failure of so many young Americans to measure up to the requirements of the armed services. It is doubtful that any group in our national life has been more diligent and conscientious than they. If they have failed in any way it has been because they lacked the time and tools necessary to do justice to their jobs. Every school term makes new and additional demands on teachers and further restricts the amount of time that can be devoted to appraisal of a child's physical condition. Yet there is unquestioned acceptance of the premise that good health is a prerequisite to effective

learning.

In the search for newer and more effective means to implement the aims of the health program as it is carried on in our schools, attention was directed to Wetzel's Grid for Evaluating Physical Fitness. It appeared that this device might have some promise as a means of evaluating a child's current health status and for collecting meaningful data for his cumulative record. It raised the question of whether it might be a more effective instrument than the health record that is recommended by the Montana State Board of Health and is commonly used in Montana schools. The problem became one of determining whether the Grid met the requirements that were implicit in the State Board of Health form, which is known as S.B.H. Form No. 1, and of setting up criteria by which an evaluation and comparison could be made.

The Wetzel Grid

The Grid was developed in 1941 by Wetzel who contributes the following description of it:

The growth and development of children is a highly complex phenomenon, too often taken for granted. But even where efforts to encourage proper growth and development are put forward, many obstacles arise. Aside from lack of time, funds, personnel and reliable or practical methods, there is an infinite variety of differences between children which adds greatly to the difficulties of analyzing and judging physical fitness in the individual child. This whole problem is now simplified through the use of the Grid for Evaluating Physical Fitness, the fundamental principles

of which may be summed up as follows:

Healthy progress prefers development along a channel of given body type, on an age schedule or time table of progress specific for the subject, and with the preservation of the subject's natural physique.

The Grid consists of a set of calibrated standards by which each of the following items may be separately distinguished and measured from routine data on weight, height and age alone:

Growth	Nutritional Grade	Net Progress
Development	Physical Status	Maturation
Physique	Age Advancement	Caloric Needs
	Basal Metabolism	

For some of these ten items the Grid is the only existing method of measurement; for all of them it is the simplest.

Grid ratings are uniform and free from bias traceable to the subject, examiner, or circumstances of examination.

The Grid method of checking nutritional and developmental progress facilitates early detection of abnormal trends toward obesity, "malnutrition" or undesirable retardation---which may be promptly recognized and dealt with.

"Old", forgotten and usually disregarded data on weight and height assume new value when plotted on the Grid. The work already done in obtaining these measurements on children is thus fully reclaimed and put to use in constructing their individual Grid records.

Underpar subjects and the child who is "not doing well" may be screened out at a glance for further examination.

Each child's Grid record becomes an aid to prognosis; it summarizes progress attained, forecasts progress to follow and affords a means to judge individual performance by comparison with standardized guide lines of achievement.

"Before" and "after" Grid records are of special value in controlling the effect of therapeutic efforts in obesity, diabetes, undernutrition and in endocrinological, cardiac and psychiatric problems.²

Oliver adds the following information about the Grid and its use, based on his experience with it in England:

The Grid is divided into three panels.

1. Panel A constitutes the channel system and gives a picture of how development is proceeding.
2. Panel B is the time table or age schedule of development (auxdrome) and indicates the speed of development.
3. Panel C constitutes the energy panel and indicates the basal heat production per day.

Panel A.

From the data Wetzel found that children fall into nine general body types (See Fig. 1). Each of these body types is represented in Panel A by a channel, the width of which has been determined upon the chance distribution around an average or mean. These channels sloping upward from left to right are grouped symmetrically around the M, or average medium build channel, with the A channels to the left representing above average, and the B channels to the right representing below average.

<i>A₄ / A₃ / A₂ / A₁ / M / B₁ / B₂ / B₃ / B₄</i>				
<i>Heavy Obese</i>	<i>Stocky</i>	<i>Average Medium Build</i>	<i>Thin</i>	<i>Extreme Thinness ← Physical Status</i>
<i>Obese</i>	<i>Athletic</i>	<i>Good Physical Status</i>	<i>Fair</i>	<i>Poor ← Clinical Values</i>

Fig. 1. Physique channels showing physical status and the corresponding clinical values.

²N.C. Wetzel, Instruction Manual in the Use of the Grid for Evaluating Physical Fitness, (Cleveland: NEA Service, Inc., 1941), p. 3.

Crossing the channels at intervals of ten units are the isodevelopmental lines. These developmental levels measure an individual's size, because each level represents a different value of body surface - they are in effect incremental levels.

When height is plotted against weight a point is located in the channel system at some developmental level, e.g., a child 55 inches tall and weighing 75 pounds is located at the point M-98. This is in the M channel and on the developmental level 98. A single observation of this type, while it records the physique (channel) and development (level) at this point, tells nothing of the quality of growth. It tells nothing of how the individual arrived at that point, nor does it give any indication of the direction along which growth will continue. Successive readings are far more important than a single recording because they indicate not only the development at each stage, but also the trend of growth. If it is a healthy growth the direction of the curve is channelwise. Under normal circumstances a child's channel will not be determined until about the sixth year, but as a rule before the eighth year. If, after the channel has been determined, the slope of the curve is greater than that of the channel system, it indicates "overnutrition", and if less than the channel system it indicates "undernutrition". As well as preferring channelwise progress, healthy growth proceeds at the rate of approximately one developmental level per month.

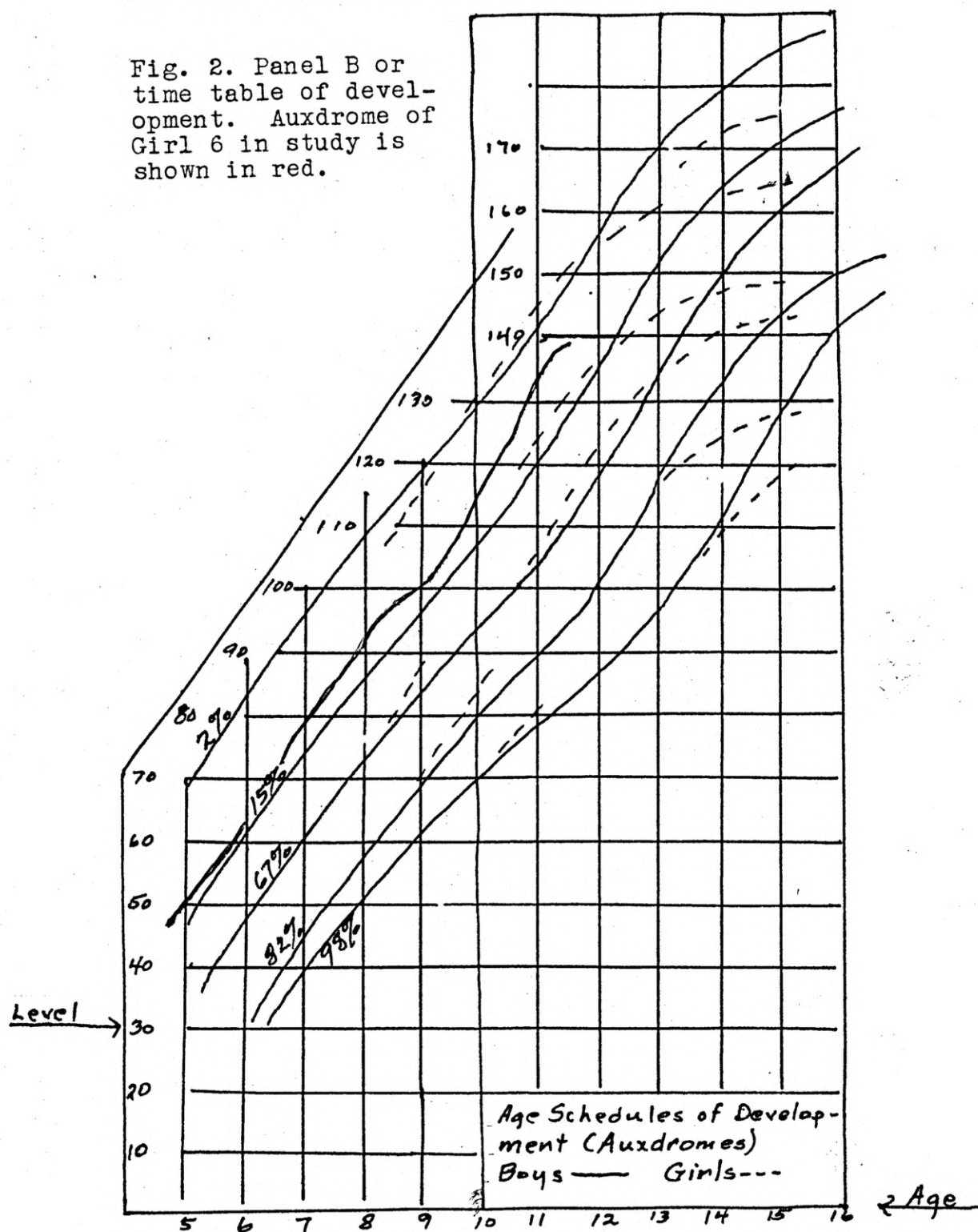
Panel B.

Just as Panel A determines the direction of growth, Panel B determines the speed of growth. The size of the individual (as determined by the developmental level in Panel A) is projected across to Panel B, and plotted against age. The resulting curve constitutes the child's own schedule or auxdrome.

Crossing Panel B (see Fig. 2) are lines showing percentile ranking for age which have been determined from many observations on children of all types and of all nations. As healthy growth progresses at the rate of approximately one developmental level per month, an individual's own curve should parallel one of these standard curves. From Fig. 2 it will be seen that the growth pattern for girls is different from that of boys after the

age of about nine years. Girls actually mature earlier than boys, their growth spurt is earlier and their curves level off earlier.

Fig. 2. Panel B or time table of development. Auxdrome of Girl 6 in study is shown in red.



Wetzel has chosen the 67% auxdrome as the standard of reference for deciding whether an individual is advanced, normal or retarded in his development. ----

The comparison of the relative advancement of a child is with his peers. In the assessment of growth and development however, the child is always regarded as his own standard of reference in the Grid technique.³

The following statements by Oliver relative to the use of the Wetzel Grid in schools suggest that the instrument might be superior to the health record forms that are currently used:

If the height and weight of a child be taken systematically each term, and plotted on Panel A of the Grid, and if the resulting developmental level is projected onto Panel B and plotted against age, there appears a progressive picture of the growth of that child. (This is shown by the red line on Figure 2.) If that child is growing to maximum capacity, then according to Wetzel's thesis the curve on Panel A will be channelwise, and the auxdrome will parallel one of the standard curves in Panel B. Where there is any marked deviation (cutting across two or more channels) from the above standards that child should be suspected of growth failure and in need of attention.

It must be borne in mind that a shift in channel position upward from right to left does not necessarily mean growth failure leading to obesity. It may represent a recovery phase after an earlier growth failure which in the absence of previous data may not be obvious. This, of course, is permissible, in fact desirable. The conditions that do need investigation are very characteristic. They are:

1. Channel shifts downward from left to right indicating loss of physique.
2. Slowdown in the speed of development as shown by the auxdromic curve.

³ J. N. Oliver, "The Wetzel Grid. A Method of Assessing Physical Growth in Children", Journal of Physical Education (further data not available).

Cases of growth failure which are evident on the Grid are not necessarily a result of organic disease. Wetzel points out that such things as irregular habits, mental tensions, unsuccessful socio-emotional adjustments or general hygienic neglect have a baneful effect on growth. They are factors which need to be discovered and eliminated in order that growth shall proceed to the full. ----

The Grid thus recommends itself to teachers as a means of making further contribution towards the total education of their pupils in that it offers a method of discovering at a glance those children suspected of not growing to capacity, and therefore not benefiting to the full from their school years. It asks no more of teachers than that they recognize that "something is wrong" with such children, and that they be singled out for expert attention.⁴

Wetzel and Oliver have thus built a strong case for the Grid. It appeared that its use in the classroom, without making excessive demands on the teacher's time, would provide a much sounder basis for appraising a pupil's physical condition. Before recommending its use in preference to other instruments it was felt that further tests of its suitability should be undertaken.

Tests of Suitability of the Grid

Two of the questions which arose regarding the Grid and the claims made for it were:

1. Could the claims made for the Grid be verified by a retrospective study of the health records of a group of children?

⁴ Oliver, op. cit., p.6 .

2. Is the Grid sufficiently comprehensive in scope to be used as a part of the child's cumulative health record?

The second question required that a comparison be made between the Grid and the present health record (Montana State Board of Health - S.B.H. Form No. 1). The features of each were evaluated.

The problem was approached with these specific objectives as a basis for determining suitability:

1. Can instances be found that indicate corrective steps could profitably have been taken earlier in the child's school life?
2. Can it be shown that the time involved in using the Grid would not be prohibitive?
3. Would the use of the Grid have advantages other than affording a better means of appraising a child's physical condition?

It was felt that if a careful study brought out affirmative answers to these questions selection of the Grid in preference to other available forms would be justified.

Method of Procedure

In order to carry out the retrospective phase of the study fifteen pupils were selected from the sixth grade of the Longfellow School in Bozeman, Montana. The health records of these children had been kept in the local school

system since the time they entered kindergarten. Fourteen of the children chosen had physical characteristics that seemed to vary from "normal". The fifteenth was selected because there was reason to believe that his socio-economic background had not been as favorable as that of his classmates. Although there were several other pupils in the grade whose health records were complete from the time they were five years of age, they were considered to be less promising material for the retrospective study. Their physical status at the time seemed to preclude the possibility of finding any irregularities in their growth histories.

The heights and weights of these children were taken from their health records and plotted on Panels A and B of the Grid. In cases where there was a marked deviation on Panel A (which was likewise reflected on Panel B) the child's parent was consulted to learn whether the irregularity could be explained in the child's health history.

In order to determine the amount of time needed to complete the entries on the Grid each chart was considered separately and the time in minutes noted. To compare the time required to make a single entry, as is done each weighing period, the figures used included the time needed for actual weighing and measuring. Two timers were used during the January weighing period. One checked the amount of time necessary to complete the entry for each of the fifteen subjects

on S.B.H. Form No. 1. The other recorded the time necessary for making the entries and completing the two graphs on the Wetzel Grid. For comparison an average time was computed for each process.

To determine whether the Grid was sufficiently comprehensive in the scope of its data to be used as a part of a pupil's cumulative record the contents of its major divisions were checked against those of S.B.H. Form No. 1 and the similarities and differences noted.

The results secured in the probe of these three areas are given in Chapter II.

CHAPTER II

RESULTS OF THE STUDY

Although this study was undertaken principally for the purpose of evaluating the Wetzel Grid in its possible relation to the health program, it was soon apparent that the Grid had considerable public relations value. The parents who were consulted about their children's graphs seemed highly pleased that a more scientific approach was being made toward appraising physical status.

The Retrospective Findings

The reasons given for the deviations that appeared on the graphs are shown in Table 1. The numbers in the columns titled Boys and Girls refer to individual children whose graphs are found in the Appendix. For example, the number 4 in the first line of the Girls column indicates that illness was given for a deviation on the child's graph. Complete explanations, together with information about the time consumed in transferring data from the health record to the Grid, channel progress and height-weight relationship, are given on the individual graphs in the Appendix.

The items in Table 1 are discussed separately in the section which immediately follows it. There they are considered in their relationship to the study, not as in individual cases.

TABLE 1. REASONS GIVEN FOR DEVIATIONS ON INDIVIDUAL GRAPHS.

Reason for deviation	Boys	Girls
Illness (childhood diseases)	3,4,5,7	4
Malnutrition*	4,6	4,7
Favorable reaction to school situation	2,5	5,8
Unfavorable reaction to school situation	2	5,6
Emotional problem other than school	7	
Hyperactivity	3,4	3,7
Heredity**	1,7	4,7
Inaccurate records	6	1,2

* Based on the writer's estimate of family circumstances.

** Based on parent's opinion.

Illness. In cases where illness was given as the reason for deterioration of physical status it was one of unusual severity or long duration. It was usually associated with one of the childhood diseases - measles, chicken pox, mumps, sore throat or influenza that most children take "in their stride". The incidence of the disease would not normally throw the child's graph off its channel. However, one boy (3) suffered from a cardiac and blood condition that contributed to a slow but steady deterioration. In only one case (Boy 5) the Grid might have helped to forestall further loss of physique due to an organic cause. Had the school

nurse been informed of the unfavorable trend the graph was taking she might have arranged for an earlier removal of the boy's infected tonsils.

Malnutrition. As stated in the footnote to Table 1, the presence of malnutrition was based on the writer's opinion. The parents in these cases would hesitate to admit that the children might not have had proper diets. However, the family circumstances were known. Irregular employment and having several children to feed were considered to have affected the amount and kind of food these children had during their early school days. With the exception of one (Boy 6) who maintained his channel satisfactorily, there was no other reason for the graph inclining to the right.

The American Journal of Public Health makes the following report of a study of underweight children:

We have reported on our experience with a group of one hundred underweight children whose growth patterns were studied at the nutrition clinic. We found this physical syndrome constituted a problem to the mother, child and community regardless of its clinical significance. Diet alone, in the conventional sense, could not resolve this problem. Indeed, it often heightened the mother's anxiety about her underweight child.

A search for more effective ways of dealing with the problem led to exploration of some of the conditioning factors. Ignorance and economic pressure were undoubtedly involved, but it was difficult to evaluate to what extent, for often they were complicated by physical and social ills that impaired the mother's capacity to function adequately.

What emerges most clearly from our study is that most of these children presented eating prob-

lems that began in infancy or early childhood and were rooted in social, cultural and psychologic complexities of their environment. A better understanding of the individual, the family setting and the factors that motivate eating behavior will stimulate new approaches to the problem of nutrition education.

Huntley and his associates make the following comments based on their study of the health records of Philadelphia school children for the years 1925-27, 1932-34 and 1947-49:

The data indicate that children from economically favored areas were taller and heavier than children from economically underprivileged areas. Both economic groups showed a secular increase in growth. During the depression years, 1932-34, children in the lower economic group showed no interruption in their secular trend. On the other hand, children in the economically favored areas during the depression did show a significant deviation from their secular trends. This deviation was statistically significant for height in boys and for stockiness in both boys and girls.

Although the data are not conclusive, they do indicate that further tests should be made of the reliability of height-weight measurements of school children as a continuing index of nutritional status.⁶

These findings of Huntley may provide the reason why one child, whose record was examined because it was felt he might represent an underprivileged subject, was the only one of seven boys who maintained his channel satisfactorily.

⁵Ethel Maslensky and Norman Jolliffe, "Factors Related to Underweight in a Selected Group of 100 Children in New York City," American Journal of Public Health, Vol 45 (Nov. 1955), pp. 1454-61.

⁶James M. Huntley, et al., "Effects of Economic Factors on Children's Growth," American Journal of Public Health, Vol. 45 (Aug. 1955), pp.1054-61.

Favorable Reaction to School Situation. Three of the four children listed under this heading showed a definite improvement in channel position during their year in the fourth grade. The parents in each case felt that scholastic progress and the feeling of security that the teacher imparted contributed to better physical status. The fourth child was under heavy emotional stress during that year. Her mother felt that if there had been any loss of channel position it should have occurred at that time. Since the child was highly sensitive and the mother unusually discriminating, it was felt that no undue liberty was being taken in assuming that the teacher had helped to maintain the child's equilibrium.

Unfavorable Reaction to School Situation. The boy listed under this heading in Table 1 had been unsuccessful most of his school life. The fact that his response to two of his teachers is reflected in better physical status is noteworthy. His loss of channel position (A3-M) might be due to another factor besides dislike of school. His physical stature, while declining on the graph, is becoming similar to that of three siblings. His mother stated, however, that he had been incompatible with most other teachers.

The two girls who had deviations attributed to this cause had to attend a different school for a year while they were in the primary grades. In each case the emotional strain was evident on their graphs. Both showed a gain in

status after they returned to the class with which they were originally associated.

Emotional Problem Other Than School. The Grid graph of Boy 7 shows a marked deviation (97-97) between January and October in 1954. During this period his parents were in Alaska and the child was left at the home of his grandparents. He was extremely lonesome, and in attempts to help him adjust, his grandfather had undertaken activities with him that were considered too strenuous for a child of that age. A recovery trend is not evident until two months after the family was reunited.

An interesting study of the Physical, social and emotional effects of home conditions was reported by Jackson.⁷ This study attempted to determine the differential in the social, mental, emotional and physical growth and development of an experimental group of elementary school children who had lived in low-rent public housing for three and one-half years as contrasted to a control group of their peers who resided in slum housing in the neighborhood for some length of time. The families of the public housing group had lived in slum housing prior to being re-housed by the New York City Housing Authority. The subjects were 253 Negro pupils from two neighboring schools in the Harlem area of Manhattan.

⁷William S. Jackson, "Housing and Pupil Growth and Development," Journal of Educational Sociology, Vol. 26 (May 1955), pp. 370-80.

The Wetzel Grid was used in studying the physical growth and development of children in the two groups. Twenty extreme deviates were interviewed to obtain their opinions as to the significance of the housing in which they lived on their personality development. These pupils indicated that their home life and neighborhood relations were much more satisfactory since they had moved into the housing project. The squalor of the slums prevented most of the children who lived there from having satisfactory social relationships.

Jackson's report implies that improvement of the material conditions of the home will not be reflected in an improvement of physical status. However, the evidence of this limited study points to the fact that improved mental, social and emotional conditions will enhance physical growth.

Hyperactivity. In the absence of objective measures of hyperactivity which can be readily interpreted by parents and teachers, the opinion of the parent that the child had been over-active had to be accepted. The parents of the boys and girls listed under this item felt that the children had drawn too heavily on their physical resources and had become over-tired. In each case the over-exertion was in connection with play or recreational activities.

Heredity. This is such an important factor in a child's growth and development that it could easily be used as an excuse or subterfuge. The parents who offered family char-

acteristics as a reason for loss of channel position in Panel A or slow development in Panel B did so only after a thorough search of the child's background for some other reason. Acquaintance with the child's family made the parents' estimate in these cases seem entirely reasonable.

Inaccurate Records. In two cases (girls 1 and 2) the Grid graphs showed marked deviations that should have been explainable by an unfavorable situation in the child's history. The parents of these girls have shown more than average solicitude in the growth and welfare of their children, but they were unable to account for the loss of physique. One of the families had kept monthly records of the child's weight, and her uncle who was a physician had given her regular physical check-ups. There had never been, in the family records, any evidence of a change in growth trend that would account for two pronounced deviations on her graph. It was therefore assumed that an error had been made in measurement or recording at school. The deviations might have a different explanation according to the Harvard Growth Study and the Forsyth series.

The former study was made on a group of girls whose height and weight records were studied from birth to adolescence. The latter study covered a group of sixty-five girls for periods of two to four years. These girls were clinic-

ally healthy and free from known or suspected pathosis. A conclusion reached in both these studies was:

Constancy of channel position is not a usual phenomenon in girls. Deviations exceeding the tolerance limits given by Wetzel are common, and the Grid does not entirely correct for changes in the female body build during growth and maturation.⁸

Since the two girls (1 and 2) were both only twelve years of age there would be a thirty to forty percent chance that their graphs would show deviations if the results of these two studies are valid.

The Factor of Time

Either lack of time or lack of emphasis might be used in answering the charge that the schools have failed to fulfill their obligations to the health program. Probably few would challenge the statement that social and academic competence are emphasized to the extent that other curricular aims are forced to play supporting roles. If we plotted the length of the curriculum against its breadth on a grid we would probably get a definite tendency toward obesity. If more time than five to six hours were available to contain this growth we could get a more normal schedule of development. The classroom teacher is forced to consider minutes almost as precious as children. Hence, time is a consideration in evaluating the usefulness of the Grid.

⁸Stanley M. Garn, "Individual and Group Deviations from 'Channelwise' Grid Progression in Girls," Child Development, Vol 23 (Sept. 1952), pp. 198-206.

The time required to put the necessary data on the Grid, as compared to that used for the same operation with S.B.H. Form No. 1, would not be a limiting factor. Table 2 indicates that plotting points on Panels A and B of the Grid requires on the average only one and one-fifth minutes more than recording a child's height-weight data on S.B.H. Form 1.

TABLE 2. COMPARISON OF TIME REQUIRED ON WETZEL GRID AND STATE BOARD OF HEALTH FORM NO. 1.

Health record	To fill in original information	To make entries during weighing periods
Wetzel Grid	6 min.* 26 min.**	2 min.
S.B.H. Form 1	4 min.*	4/5 min.

*Does not include height-weight entries.

**Includes height entries from pre-school through Grade 5.

The figures in Table 2 represent the average time spent on the records of the fifteen children involved in the study. It is reasonable to expect that work with the Grid would take slightly less time than is shown in the table after the worker was more familiar with it. The four minutes required to fill in original information on S.B.H. Form No. 1 does not include copying the age-height-weight data as does the twenty-six minutes shown for the Wetzel Grid. The State Board of Health records used in this study contained the age-height-weight data when the study was begun.

Comparison of Features of Wetzel Grid
and S.B.H. Form No. 1

In evaluating the Wetzel Grid with reference to its use as a part of the child's cumulative record it was necessary to determine whether the information it provided was sufficient to meet the standards of the Montana State Board of Health. In the absence of legal requirements, it was assumed that the information contained in S.B.H. Form No. 1 made it acceptable to state health and education authorities. How closely the Grid conforms to the specifications that are found in S.B.H. Form No. 1 is shown in the following outline:

1. Features common to the Grid and S.B.H. Form No. 1.

- a. Tabular age-height-weight record covering twelve school years. The Grid has 29 age-height-weight entries. S.B.H. Form No. 1 has 24 age and height entries and 144 for weight.
- b. Disease history. The two records have 15 common items. S.B.H. Form No. 1 has provision for the following diseases which are not found on the Wetzel Grid:

Influenza	Eczema	Kidney infection
Ear infection	Asthma	Growing pains
Tonsillitis	Hay fever	Convulsions
Bronchitis	Chorea	

The Wetzel Grid provides for the following that are not mentioned on S.B.H. Form No. 1:

Diabetes	Epilepsy	Ringworm
----------	----------	----------

- c. Immunizations
- d. Tests (for disease incidence or susceptibility)

- e. Narrative comment. One of the criticisms made of the Grid by a state health official was that it didn't have enough space for narrative comment. Measurement shows that the Grid has $43 \frac{1}{2}$ square inches for narrative comment as compared to 45 square inches on S.B.H. Form No. 1. However, the Grid has 36 lines that are $\frac{2}{10}$ inches apart against 30 lines that are $\frac{5}{16}$ inches apart on Form No. 1. Thus it is probable that as much comment can be put on the Grid even though there is slightly less space.
 - f. Physical findings (to show results of annual examinations).
2. Features found on the Wetzel Grid that are not on S.B.H. Form No. 1:
- | | |
|------------------------------|--------------------|
| Grid panel (graph) | Mental Data |
| Auxdrome panel (graph) | Phys. Ed. Consents |
| Metabolism panel | Phone number |
| Fluoroscopic and Other Tests | |
3. Features found only on S.B.H. Form No. 1:
- Emotional and Social Characteristics
 - Family physician
 - Family dentist

The features of any health record, in respect to the information it gives or elicits, are important only so far as they meet the needs of those who use it. Although there is more similarity than difference in needs, they do differ from one school to another. Such factors as the type of professional service that is available to assist with the health program and the amount of time that is given to it determine the amount and kind of information it should contain. The fact that age-height-weight information, which is common to all the records that have been examined by the

writer, seemed to have so much more significance on the Grid tended to recommend the Grid technique.

This chapter has described the results of the search for answers to the questions relative to the Grid and its acceptability as a substitute for S.B.H. Form No. 1. These were questions of the validity of the technique, the amount of time involved in using it, and the advantages it offered as a means of appraisal. The conclusions and recommendations evolving from the study are found in Chapter III.

CHAPTER III

CONCLUSIONS AND RECOMMENDATIONS

In drawing conclusions from this study, health instruction and health or growth observation are considered separate areas. There is no quarrel with health instruction as it is currently handled in most schools. In the field of health or growth observation there are shortcomings. Most schools periodically gather age-height-weight data which are perfunctorily recorded on report cards or health records. These raw numbers mean little to a parent or a teacher who has not been trained to interpret them. Even if they were placed with a series of previously collected data, which is done on the cumulative record, it would be extremely difficult to discern growth trends. The difficulty of trying to interpret the data tends to discourage teachers from using them.

Conclusions

The experience gained from this study, particularly in its retrospective phase, indicates that age-height-weight data have a story to tell, sometimes a dramatic one. It may take a year to unfold, but in some instances the trend is established from one weighing period to the next. It is gratifying to be able to detect that "something is wrong"

and take measures to rectify it before harm is done. Even though most of the deviations investigated were "water over the dam", there was one case (Boy 1) in which an unfavorable trend was brought to the attention of the parents. Constructive measures were then taken to restore it.

One of the questions that this study was expected to answer was - Could the claims made for the Grid be verified by a retrospective study of the health records of a group of children? In other words, might the discovery of unfavorable trends had led to a correction of the causes if action had been taken on them at the time? In the case of Boy 5 there was little doubt that earlier referral might have led to earlier removal of his infected tonsils. In the cases in which undernutrition was suspected to have contributed to channel loss, referral might have led to improvement of conditions. There were agencies available to assist the families if it had been necessary.

If only one child, whose condition might otherwise remain undetected, could be restored to maximum growth, the use of the Grid would be justified for a teacher. The only justification that would be necessary is the slight difference in time that is required to complete the graphs on the Grid. The cost in time is approximately one minute per pupil - a small price to pay for the clearer picture that the Grid gives. There is reason to believe that teachers would

derive considerable satisfaction from working with a device that holds promise of showing concrete results.

In comparing the Grid to S.B.H. Form No. 1 with respect to its capacity for information other than age-height-weight data, there is little to choose between the two. Aside from the record of physical examinations, which is as complete on one form as the other, little use is made of the additional features. The Social and Emotional Characteristics section of S.B.H. Form No. 1 has much to recommend it, but teachers seldom use it. In the fifteen health records that were used in this study there was not a single entry under that section. It is hardly comprehensive enough to use for counseling or guidance information. Teachers hesitate to put remarks in this section for fear they might be used later to the child's disadvantage. It seems reasonable to believe that the deeper insight into a child's growth pattern that can be gained through the use of the Grid would encourage teachers to make fuller use of its features.

Recommendations

As the reader will probably have inferred by this time, it is felt that the use of the Grid for evaluating growth data and health status would be an economical and effective

method of implementing our health program. If the services of a school nurse were available to assist in collecting, recording and interpreting the data, together with making home calls when remedial measures were to be undertaken, the effectiveness of the Grid might be greatly enhanced.

Another recommendation that developed from the study was that weighing periods be differently spaced. The data which were used on the graph were, for the most part, collected in October and the following January. It appears that a late February or early March measurement would avoid both the usual spring height spurt and the effects of over-exertion during the Christmas holidays. Both of these tend to produce a channel loss that could be misleading.

It developed from the exacting task of transferring ten to twelve sets of age-height-weight data onto each of the Grids that the use of a transparent right angle or right triangle would greatly facilitate the location of developmental and growth levels on the graphs. Besides increasing accuracy, the use of such a device would appreciably reduce the amount of time needed to complete the graphs on Panels A and B.

It would be recommended, before adopting the Grid in a school system, that each teacher who would use it be permitted to experiment with the health records of several pupils in a manner similar to the retrospective study that was

undertaken in this investigation. If the teachers had this opportunity, at least through one weighing period, it is believed that acceptance of this new technique would be spontaneous.

The individual graphs of the fifteen children used in this study are found in the Appendix. These show the child's progress along the developmental levels, his rate of growth in figures, and the explanations that were given for the trends of his progress.

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APPENDIX

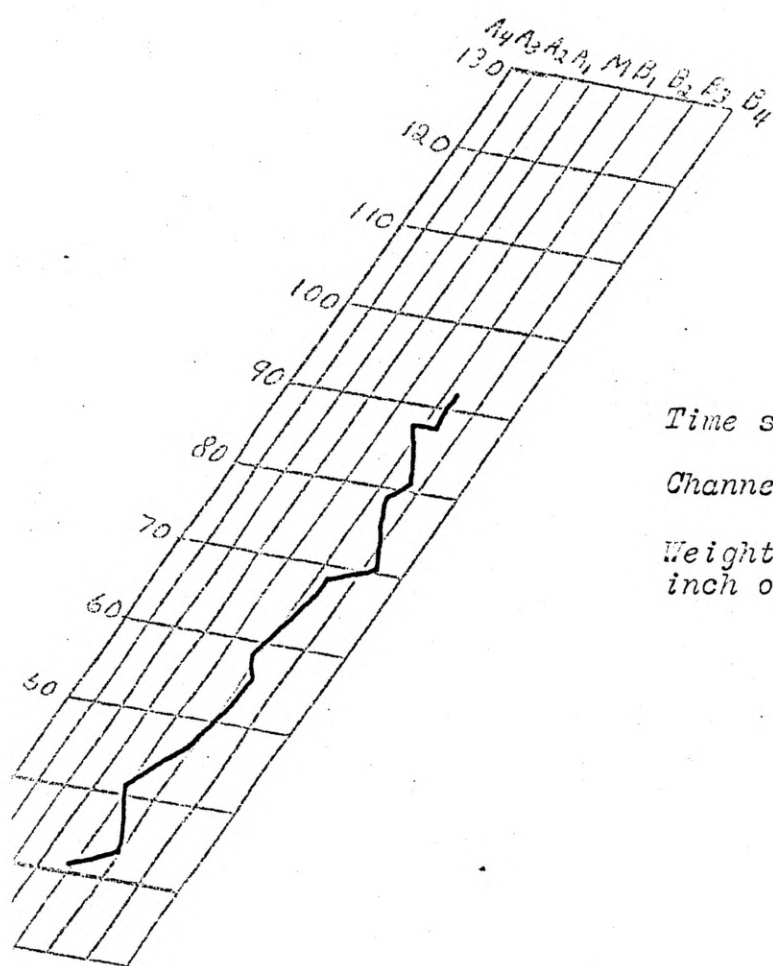
GRID GRAPHS OF FIFTEEN CHILDREN

SELECTED FOR STUDY

Boy #1 Deviations on isodevelopmental lines accounted for:

69-71 His fourth grade teacher had noted on his health record that fatigability was evident during that year.

87-83 This was carefully checked by the family physician after the family was notified. Poor progress during this period was attributed to over-exertion during the Christmas holidays. This boy has had annual physical check-ups by the family doctor. It appears that his growth pattern is following that of his father and two older siblings. His father didn't mature much physically until after he reached the age of eighteen.



Time spent with chart - 23 min.

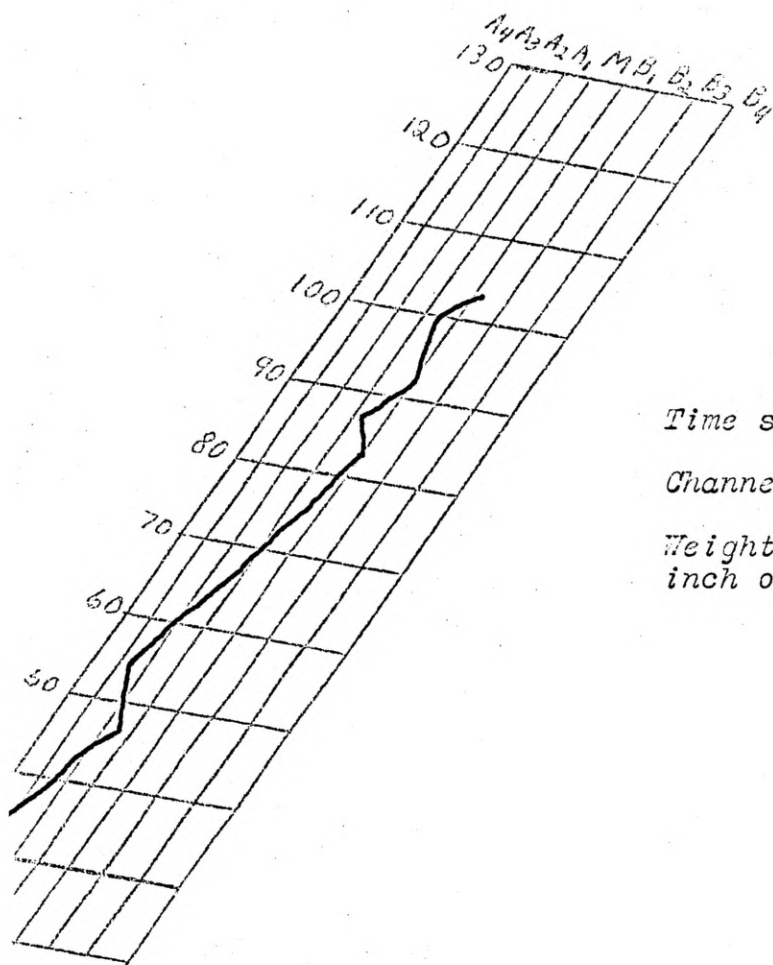
Channel progress - M - B₂

Weight gain per
inch of height - 2.35 lb.

Boy #2 Deviations on isodevelopmental lines accounted for:

47-45 The improved rate of growth during the time
83-37 he spent in the second and fourth grades was
attributed to the fact that he had even-
tempered and sympathetic teachers during those
years. His scholastic achievement was far
below standard in all other grades. He fre-
quently met with frustrations and did not
respond to his teachers' efforts to stimulate
him.

100-103 During February 1956 he was out of school for
a week with mumps and influenza. He lost
four pounds during this illness.



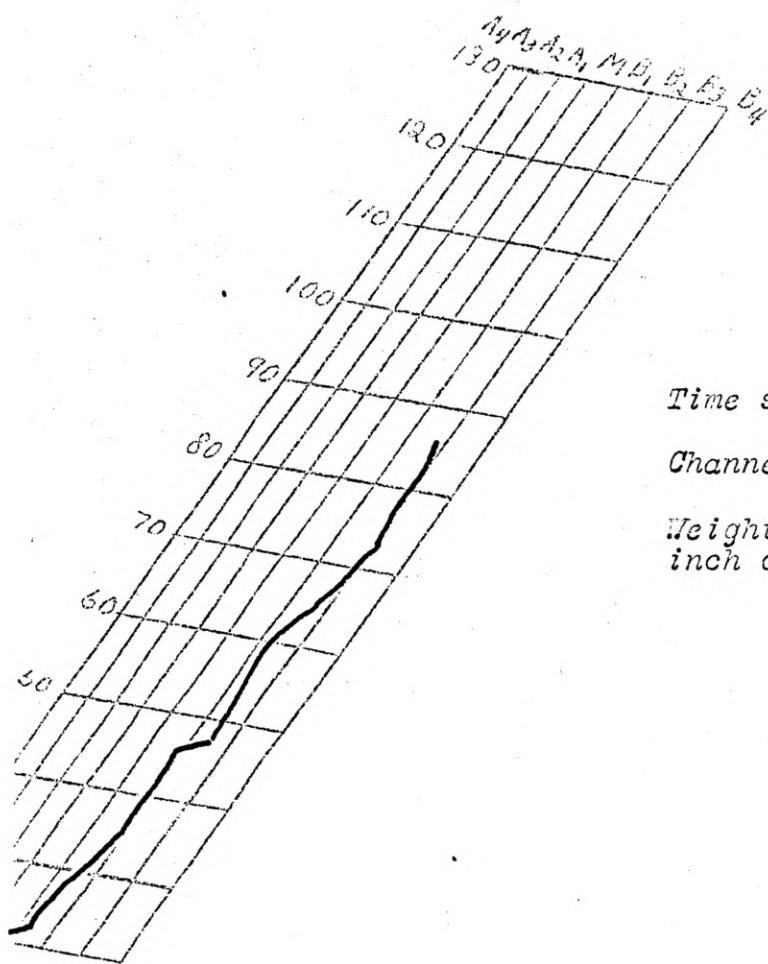
Time spent with chart - 17 min.

Channel progress - A3- M

Weight gain per
inch of height - 2.45 lb.

Boy #3 Deviations on isodevelopmental lines accounted for:

21-23 This boy's guardian attributed these deviations to over-activity during summer vacations. He has had regular physical examinations to keep check on unfavorable blood and cardiac conditions.



Time spent with chart - 22 min.

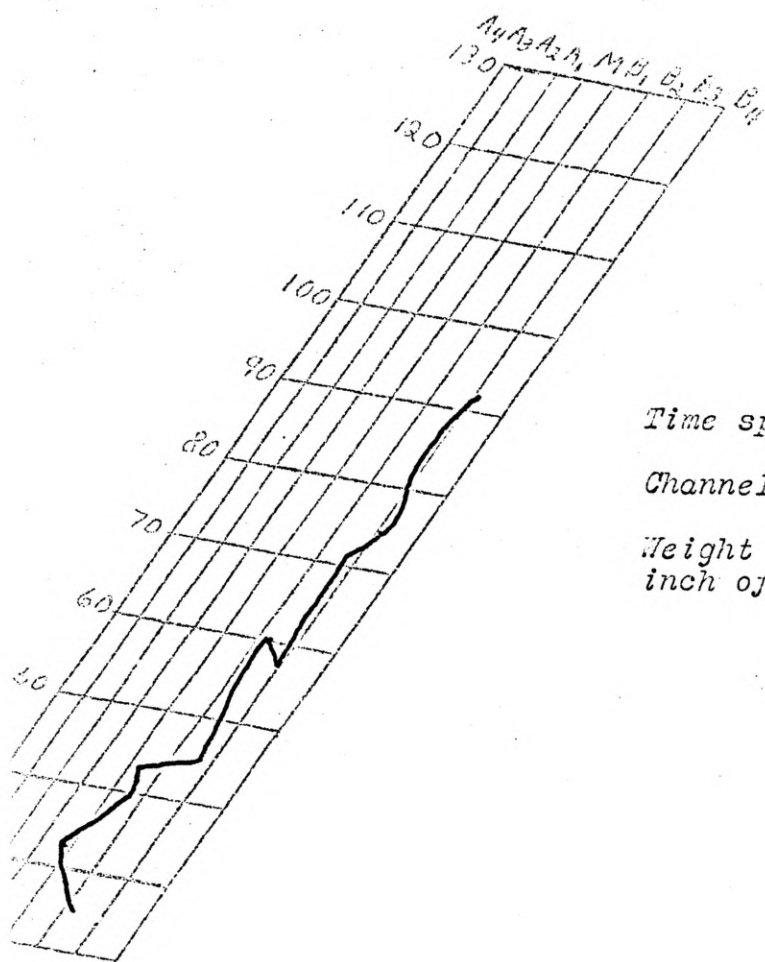
Channel progress - M - B₂

Weight gain per inch of height - 2.25 lb.

Boy #4 Deviations on isodevelopmental lines accounted for:

43-45 The boy suffered a severe attack of measles during this period.

60-53 He was severely ill with chicken pox. Both his illnesses occurred during the summer when he was over-active and "run down". His mother reported that his appetite has always been poor. Economic factors may have had some influence in this case.



Time spent with chart - 20 min.

Channel progress - B₂- B₃

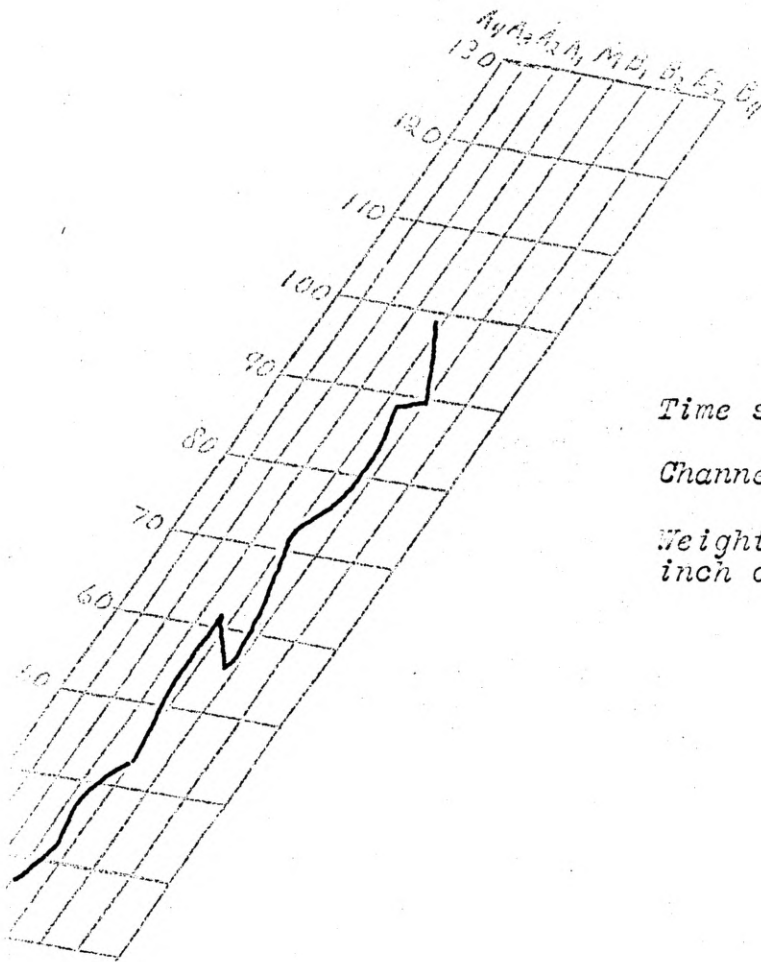
Weight gain per inch of height - 2.50 lb.

Boy # 5 Deviations on isodevelopmental lines accounted for:

61-65 During the summer of 1952 he had recurring intestinal disturbances similar to "stomach flu". Four to five degrees of fever accompanied the attacks.

55-72 His year in the fourth grade was particularly successful.

90-97 This represents unusually favorable growth following a tonsillectomy in April, 1956. He gained five pounds in four weeks.



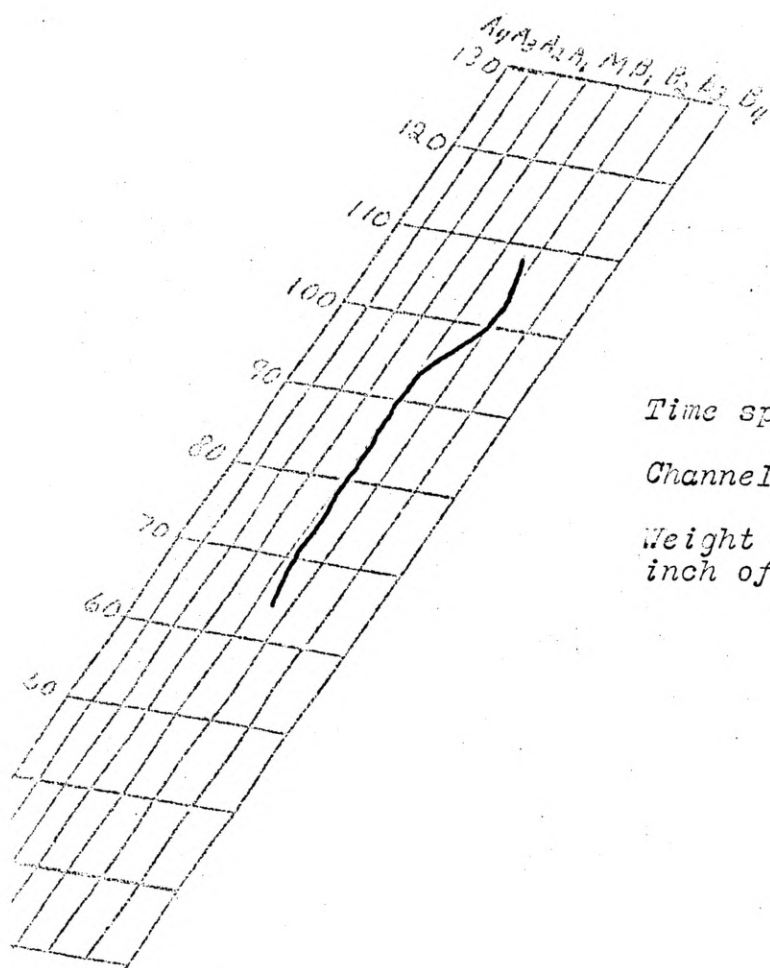
Time spent with chart - 24 min.

Channel progress - A₇ - M

Weight gain per
inch of height - 1.41 lb.

Boy #6 Deviations on isodevelopmental lines accounted for:

This boy had no serious illness since he started school. A skin graft during his kindergarten year is the only thing that might have interfered with consistent maximum growth. He was chosen for this study because it was believed that socio-economic factors might have had some influence. He comes from a large family, and the parents have not been regularly employed.



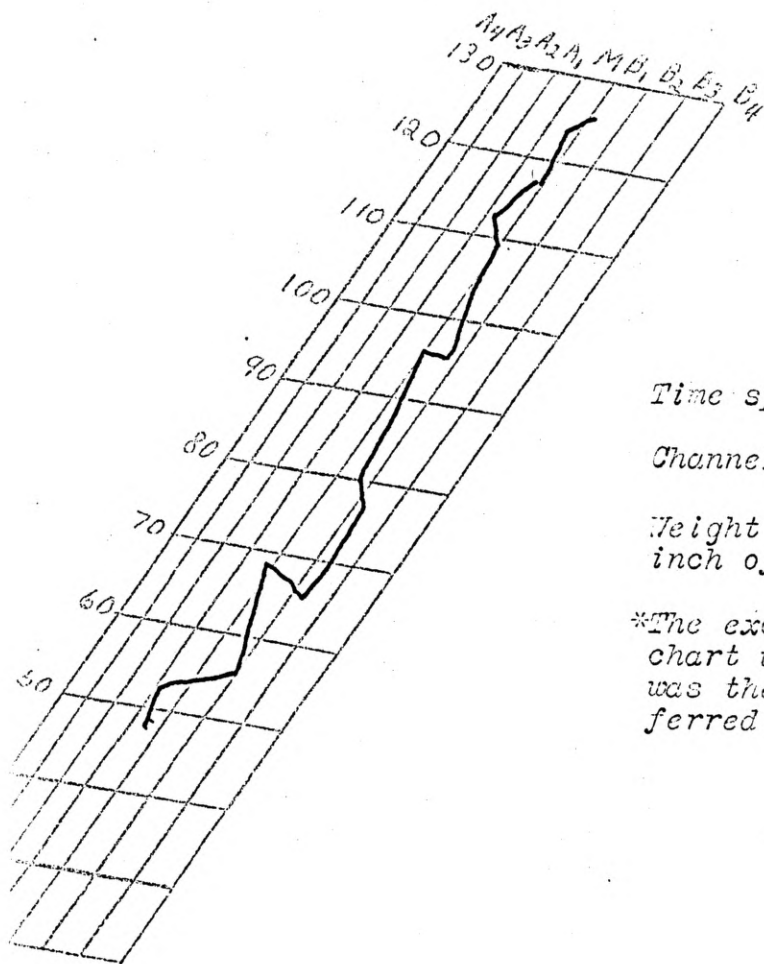
Time spent with chart - 15 min.

Channel progress - M - M

Weight gain per
inch of height - 3.22 lb.

Girl #1 Deviations on isodevelopmental lines accounted for:

In this case there were discrepancies between cords kept at home and at school. The child's parents had kept a regular record of her weight. Her record showed no reason for the three pronounced deviations on her graph. The child has never been seriously ill. She has had annual check-ups by her family physician.



Time spent with chart - 60 min.*

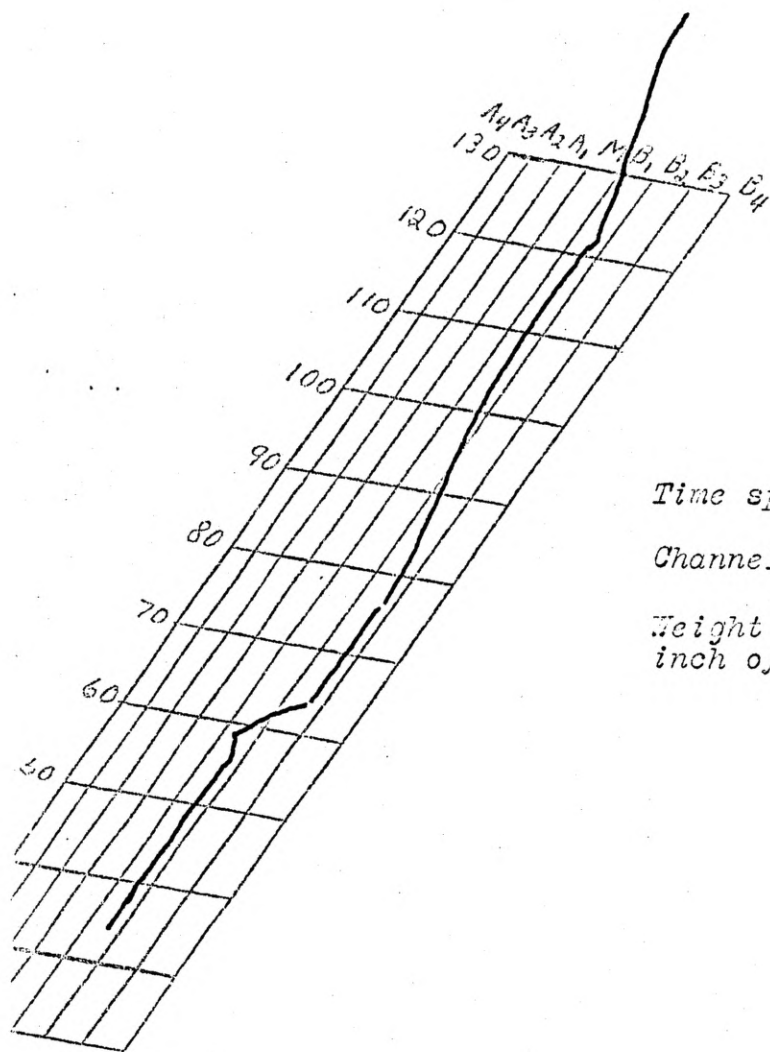
Channel progress - A1- B1

Weight gain per
inch of height - 3.15 lb.

*The excessive time taken with this chart was due to the fact that it was the first to which data was transferred from S.B.H. Form No. 1.

Girl #2 Deviations on isodevelopmental lines accounted for:

59-63 The mother stated that there had been no unusual condition to account for the difference in the growth pattern between May and September in 1951. During this period the child gained two and five-eighths inches in height and only two and one-half pounds in weight. Her average gain was almost four pounds per inch of height.



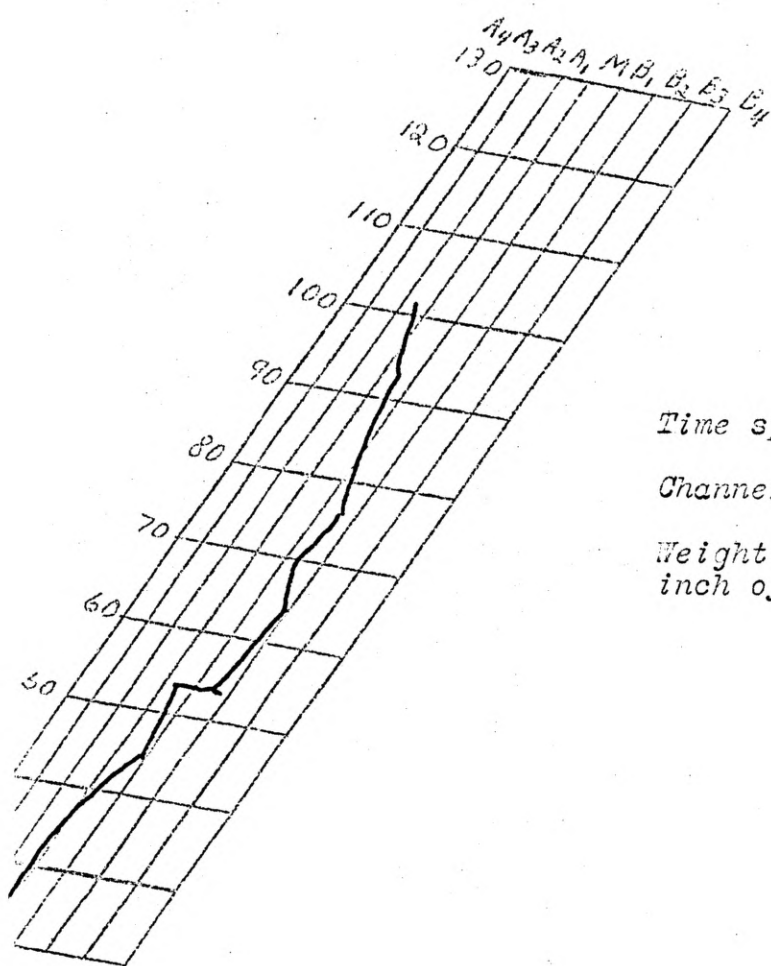
Time spent with chart - 23 min.

Channel progress - B₁- M

Height gain per
inch of height - 3.90 lb.

Girl #3 Deviations on isodevelopmental lines accounted for:

53-53 This deviation occurred between May and September in 1952. The child had finished the second grade. Her mother said she had been over-active during that summer. She gained three-fourths of an inch in height but lost one-fourth of a pound in weight during that period.



Time spent with chart - 20 min.

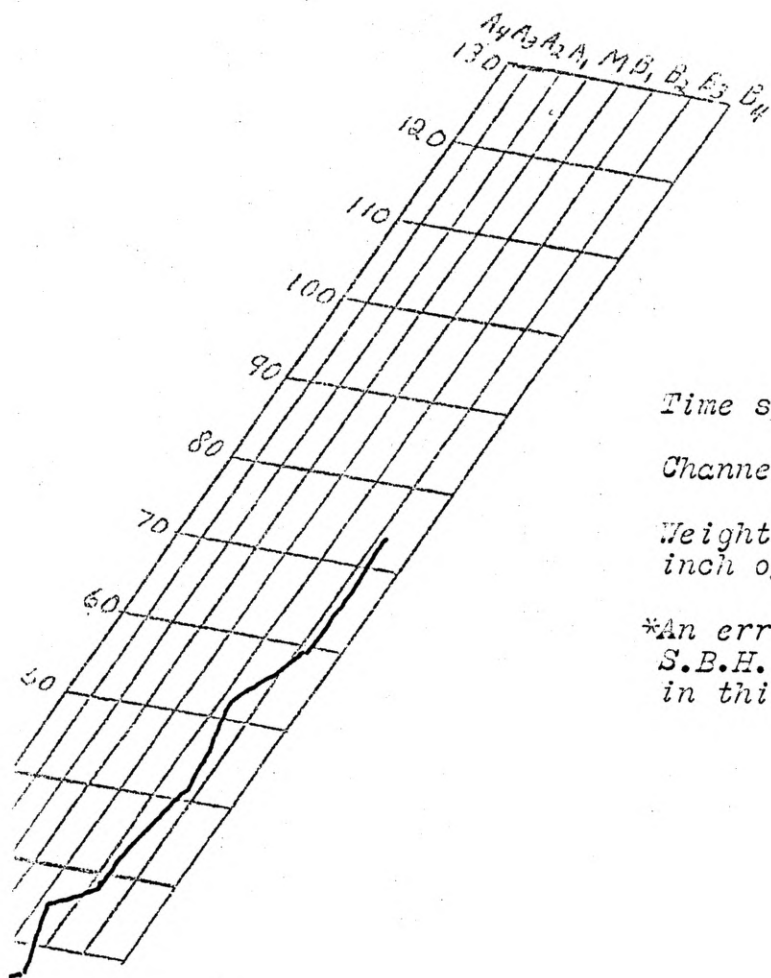
Channel progress - A1 - A1

Weight gain per
inch of height - 2.95 lb.

Girl #4 Deviations on isodevelopmental lines accounted for:

13-18 The child was severely ill with mumps during her year in kindergarten.

20-54 During this period the child had regular check-ups to determine the cause of fever that occurred periodically. This is an over-active child who has had a consistently poor appetite. Her father followed a similar growth pattern.



Time spent with chart - 30 min.*

Channel progress - B1- B3

Weight gain per
inch of height - 1.93 lb.

*An error in copying figures from
S.B.H. Form No. 1 added to the time
in this case.

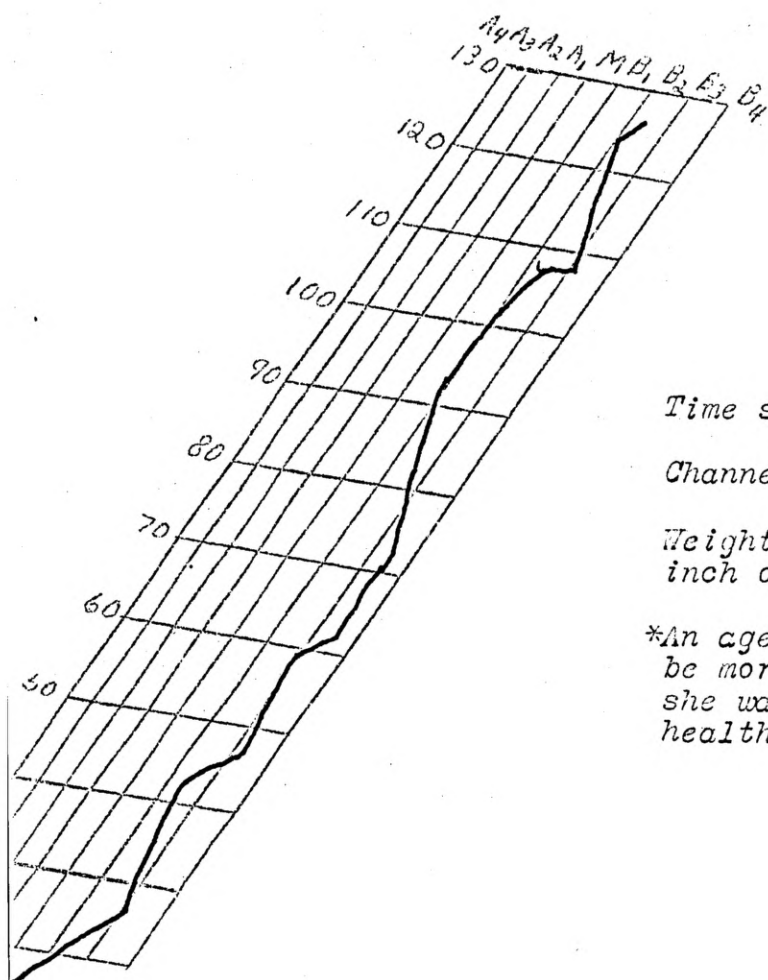
Girl #5 Deviations on isodevelopmental lines accounted for:

16-26 A change in schools during her kindergarten year created an emotional problem.

26-42 In spite of bronchitis, mumps and a tonsillectomy the child showed a slight gain in channel position. She had a sympathetic teacher whom she liked.

71-94 A gain in self-confidence while she was in the third grade is reflected in physical improvement.

103-123 She became interested in playing the viola. The success she experienced helped to improve her scholastic and physical status.



Time spent with chart - 47 min.*

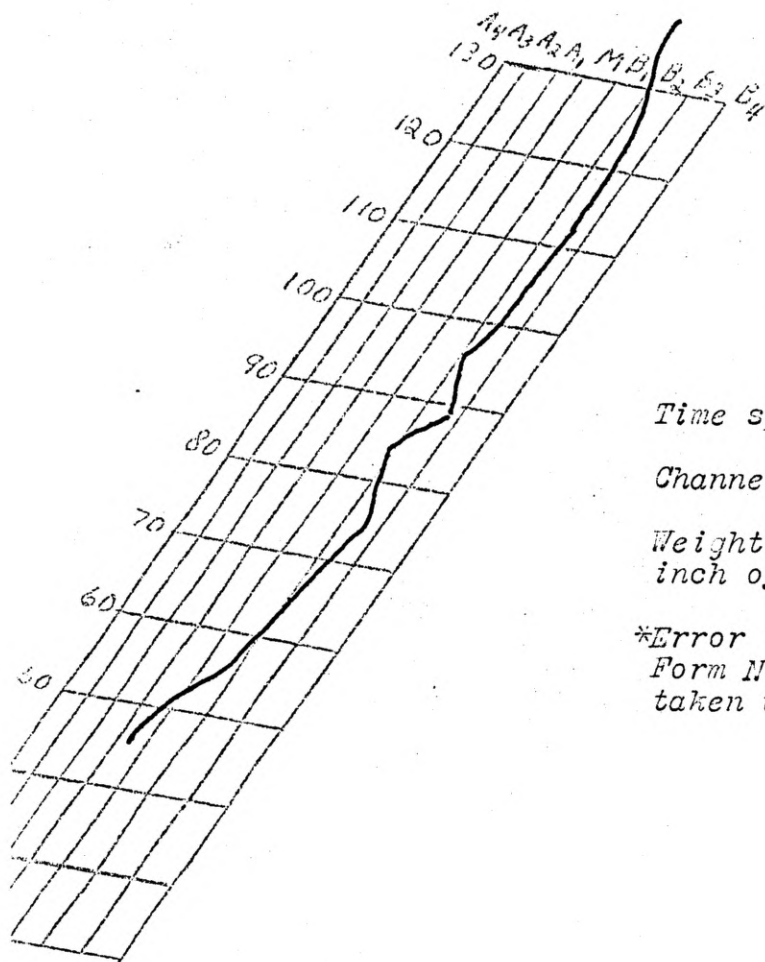
Channel progress - M - B₁

Weight gain per
inch of height - 2.99 lb.

*An age check caused this chart to be more time-consuming. She claimed she was a year younger than her health record showed.

Girl #6 Deviations on isodevelopmental lines accounted for:

83-89 This child's mother stated that a severe emotional disturbance resulted from changing schools. An improvement resulted when she was restored to the group with which she had been associated before the change. This girl has had no serious illness since she started school.



Time spent with chart - 30 min.*

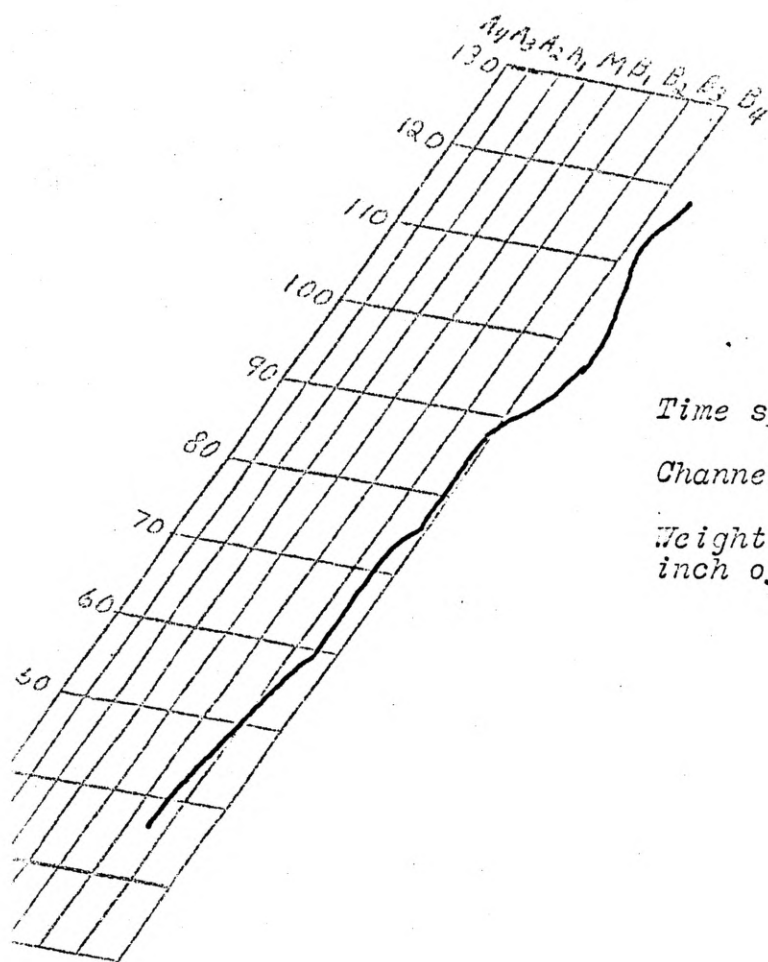
Channel progress - A₁- B₁

Weight gain per
inch of height - 3.27 lb.

*Error in calculating age of S.B.H.
Form No. 1 caused more time to be
taken with this chart.

Girl #7 Deviations accounted for on isodevelopmental lines:

This girl has had no severe illness since infancy, but she has always had a poor appetite. Her attendance record at school has been unusually good. Her mother followed a similar growth pattern until after marriage. Economic factors may have had some bearing on the steady regression.



Time spent with chart - 19 min.

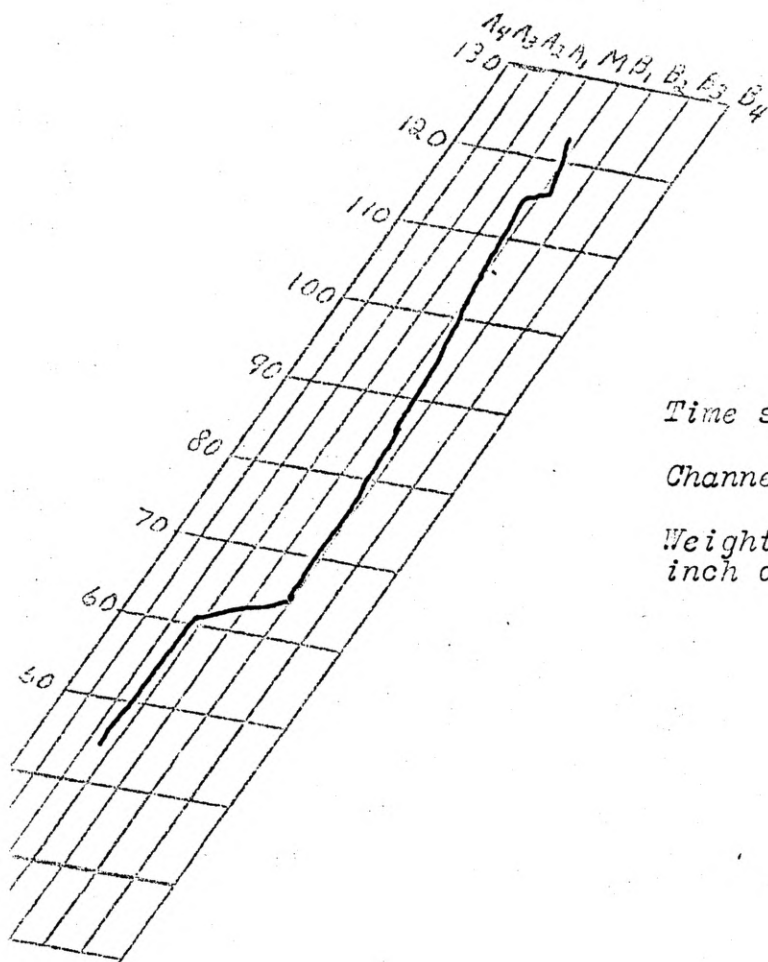
Channel progress - B2- B4

Weight gain per
inch of height - 2.48 lb.

Girl #8 Deviations accounted for on isodevelopmental lines:

This girl has never had any unusual or severe illnesses. She has always been very active physically. In the fourth grade she was under heavy emotional stress, but it is not reflected on the graph.

62-65 Her mother could not account for the loss of channel in this instance.



Time spent with chart - 24 min.

Channel progress - A1-M

Weight gain per
inch of height - 3.31 lb.