

**THE ANTHONY ELEMENTARY SCHOOL
EAT EXERCISE AND EXCEL PROGRAM
IN LEAVENWORTH, KANSAS**

An Intermediary Evaluation Report
from The Dietary Research Foundation,
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by

Stephen J. Schoenthaler, Ph.D. & Ian D. Bier, N.D., Ph.D.
President Medical Director

Dietresearch.org
(209) 293-1386

Abstract

Context: The administration and staff of Anthony Elementary School in Leavenworth Kansas suspected that their students' inadequate academic performance was due, in part, to high amounts of violence in school, "out of control" behavior, and other antisocial behaviors which were related to poor nutrition and other lifestyle factors. A literature review found a number of randomized controlled clinical trials that reported lower antisocial behavior and/or higher academic performance when vitamin-mineral supplements were compared with placebo among schoolchildren or delinquents. Similar results have been reported when nutritional modification was limited to improving available food choices. Behavior had improved between 38% to 90% depending on the population and interventions. These studies suggested that implementation of the interventions could significantly lower the behavior problems in Anthony and raise academic performance.

Objectives: To determine if schoolchildren, in Kindergarten to 5th grade, who are given: (a) low dose vitamin-mineral tablets, (b) nutritional education, (c) more nutritious foods, (d) daily exercise, physical fitness training, (e) structured activity time instead of unstructured recess, and (f) eating meals in the classroom family style instead of the cafeteria will produce (1) significantly less antisocial behavior at school and (2) improve Math and English scores on statewide standardized tests.

Design: A quasi-experimental time-series design in which all changes are implemented at the beginning of the 2003-2004 academic year and using the previous year as baseline data.

Settings and Subjects: An economically disadvantaged elementary school with approximately 350 students, similar demographically to major Eastern inner-city schools. About two-thirds of participants were minority students. In years previous to the study Anthony elementary had the highest violence and antisocial behavior, and lowest scores in both standardized Math and English tests in their 10 school district.

Intervention: Daily vitamin-mineral supplementation at 100% of the USRDA for all vitamins and all minerals (except calcium and magnesium) in a phytonutrient base. This was supported by daily structured exercise replacing unstructured recess, nutritional education, a revised school breakfast and lunch menu stressing better nutrition, and family style eating in the classroom replacing cafeteria meals.

Outcome Measures: Violent and non-violent delinquency as measured by official school disciplinary records, and Math and English scores on the Kansas Assessment tests, as standardized test given to 4th and 5th grade Kansas elementary school children every year.

Results: During the baseline year just over 2 students per weekday were referred to the principal's office for disciplinary action for "out of control" behavior, an annual rate of 438 incidents. During the intervention year, such referrals fell by 95% (438 to = 18). Referrals for disciplinary action for such behavior remains decreased 95% during this second year of implementation. Out of school suspensions fell from 52 to 13, an 80% decrease, and in school suspensions for violent acts fell from 34 to 1, a 97% decrease. Teachers also reported far less difficulty maintaining classroom control, allowing the focus to shift from classroom management to teaching issues. Teacher attrition declined from five to one per year. Most dramatically, scores on the Math and English portions of the Kansas Assessment test rose from 10th or last in the district rank to 1st in Math and 2nd in English scores.

Conclusions: Previous clinical trials have shown that poor nutritional habits in children lead to low concentrations of water-soluble vitamins in blood, thereby impairing brain function, and subsequently leading to violence, other serious antisocial behavior, and lower academic performance. These clinical trials showed that correction of nutrient-intake, through either a well-balanced diet, or low-dose vitamin-mineral supplementation usually correct the low concentrations of vitamins in blood, improve brain function, and subsequently lower institutional violence and antisocial behavior significantly. This study adds to the literature by showing that the above clinical findings can be generalized to disadvantaged elementary schools using relatively simple policy changes and implementation rather than being limited to the artificial environment of the clinical trial. The program also underscores the importance of classroom control in learning. This program should be continued, replicated in middle and high schools, and replicated in non-disadvantaged schools to see if the behavioral and academic improvements are similar.

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Section 1: The Nature of the Community, Anthony School, and the Program

The Community. Leavenworth, Kansas is a modest sized city of about 35,000 residents whose origin pre-dates the Civil War. It lies near the Kansas-Missouri border just to the west of the Missouri River and once served as a staging area for westward migration to Oregon and California. The economic base is a mixture of outlying agriculture and Federal institutions, but the latter do not contribute to the city tax base. This includes the United States Federal Penitentiary, The Dwight D. Eisenhower Veterans Administration Medical Center, and Fort Leavenworth. As a result nearly 50% of the property is rental. While the Federal Penitentiary may be best known, the city is also home of the War College where higher ranking NATO and U.S. officers attend graduate school. The outlying areas also contain several state correctional facilities. This produces an atypical environment that has the same ecological difficulties as multi-million resident cities.

First the community shows great disparity in social economic status with the community having the highest per capita percent of residents with graduate degrees in the state but also one of the highest percentages of residents below the poverty line. Due to federal exemption from the tax base, the district is in the bottom 10% of per pupil funding, similar to many inner city minority districts. The city population is 76% Caucasian, 16% African-American, 5% Hispanic, and 3% other, making racial distribution similar to major eastern and Midwestern cities, but not southern or western cities. Transience is also an issue in military towns, which lowers stability, and the high prison population leads to an increase in single parent families led by women with young children who move to the city to be close to their incarcerated husbands. Although community size suggests a typical suburban upper middle class community, the above problems are more similar to a heterogeneous inner-city culture with a high transient rate and a diverse needy underclass. Sociologists have known for over 65 years that relative deprivation next to great wealth causes the highest property and violence rates. Nationwide, one-third of all youths are arrested at least once by their 18th birthday, but the arrest rate in Leavenworth according to the 2000 Census was 38% over one year, not 18 years. The district “at-risk” rate is 48% who qualify for free and reduced meals due to poverty. These factors make the environment similar to an inner city of a major eastern city or northern Midwestern city rather than a suburban community.

Anthony Elementary School. This modest sized school of about 350 students offers pre-kindergarten through the fifth grade and is one of 10 schools in a district which had 4304 students during the 2003-2004 academic year at census. Classes are typical in size, between 15 and 25, but resources are scarce due to the poor tax base and the transient nature of the student population is problematic. Weapons detection in several district schools and bomb threats were not unknown. Our impression of the Anthony faculty, staff, and administration is very high dedication to providing these disadvantaged children high quality services. A few teachers leave each year, an average of 5 of 18, but most seemed to hope for less disciplinary and control problems that inhibit learning.

Academically, Anthony students averaged 8th on the Kansas Assessment tests of both Math and English each year when compared with the other 9 district schools. The Leavenworth First City Success program identified the following community and school

factors that put Anthony students at-risk of educational failure: high rates of violence in school, high numbers of suspended/expelled students, high poverty rate, high percent below proficiency standards on state assessment tests, and low parental literacy. Interviewed faculty added familial difficulties, transience, drugs, and student feelings of hopelessness, and anger to this list.

Anthony Elementary has the highest poverty rate in the district with 79% of students receiving free or reduced lunches. More than 60% are minorities as opposed to 24% in the remainder of the district. About half the students live in a housing project called “the ghetto.” Transient rates are 30% each year. Anthony had the highest number of office referrals and acts of violence among the elementary schools in the district. According to the principal, the police were called once a week on average.

The school district uses what is known as the Girls and Boys Town Model of Instructional Discipline, which mandates that teachers deal with all antisocial behavior with the exception of students who have lost control. This means that referrals to the principal’s office are only for major disruptive offenses. The 2,635 K-8 student body generated 4,705 office referrals, with Anthony Elementary being the highest proportion. The state average violence rate against students is 8%, but the four Title I elementary schools each exceeded this average with Anthony being the highest at 13%. Before the 2003 academic year, the principal of Anthony reported, on average, about 2 referrals per day for disciplinary matters.

Section 2: The Methods and the Results

Methodology. In 1957, two experts in education, Stanley and Campbell [1], wrote the seminal textbook on how to analyze the results of change in educational programs that is still cited today in leading social science texts [2-4]. The better educational research used what they called quasi-experimental designs rather than experimental designs [1]. One quasi-experimental design that remains in favor is called the interrupted time-series, which was used in this study. The design consists of the institution measuring the primary variable of interest (antisocial behavior in this case) repeatedly during a lengthy baseline period. Intervention then starts followed by repeatedly measuring the same variable over an equally long intervention period. A minimum of half a dozen baseline and intervention measurements are taken to determine trends over time.

The study was designed to record the number of disciplinary referrals to the principal’s office for 6 two-month intervals before and 6 two-month intervals after intervention. The theory states that the reduction in antisocial behavior immediately after intervention should be significantly larger than the average variation between adjacent cycles. This procedure is capable of detecting minor and major changes as well as whether there is any time lag before the changes appear. In this study, improvements were instantaneous appearing in the first month of implementation. Coding is simple; the date of each disciplinary referral during the two year period is placed in the appropriate two-month time frame with the results of each time frame being plotted. Campbell and

Stanley pointed out that results after program implementation are deemed to be valid (i.e. due to the program) unless one or more of eight “rival causal factors” can be identified that cannot be eliminated. In this study, all eight potential rival causal factors were considered as follows.

Main Results. There were approximately 5 schoolchildren referred to the principal’s office for disciplinary each day during the baseline year (2002-2003) or a total of just over 400 incidents. During the beginning months of the intervention year, referrals fell from about 2 per day to about 2 per month, a 95% reduction.

The monthly breakdowns during the baseline year confirmed that similar to other schools, behavior tends to deteriorate slightly over the year, is worst in the late spring, but returns to similar lower levels at the start of the next year. After a year and a half of intervention, the referral rate of children deemed ‘out-of-control’ by their teachers has remained at about 2 per month.

This stability being maintained a year and a half later strongly suggests that the greatest threats to external validity (placebo effects, Pygmalion effects, and/or Hawthorne effects) are not a factor. When these psychological confounds appear in a study, they tend to wear off in a few weeks or months, as effects unrelated to the intervention tend to be fleeting [5]. We have found no reports ever of multi-year permanent placebo effects.

The most serious acts of concern involved in-school and out-of-school suspensions. Out-of-school suspensions decreased from 52 to 13 or 80% and in school suspensions, (due to violence), fell from 34 to 1 or a 97% reduction. The 86% reduction in both types of suspensions combined (i.e., 86-14) is very consistent with a 95% reduction in faculty referrals to the principal’s office and cross-validates that the results were not biased due to the principal’s central role in the study since faculty and staff generated similar results.

The second area of interest was academic performance on the statewide Kansas Assessment Tests for English and Math. Anthony’s performance in both subjects was near the bottom in the District for the spring 2003 tests. However, they rose to first in English and second in Math when compared to the other 9 district schools in the spring of 2004. Equally impressive, for the first time, not one child failed in Math. No child really was left behind at Anthony in Math in 2004.

Scientifically, we are less certain that these results were due to the intervention program since it was not possible to measure growth bi-monthly; the test is only given once a year. However, more confidence can be placed in the Math and English findings if the same results occur in May of 2005. That information will be included in the final report.

Section 3: Rival Causal Factors concerning Internal Validity

Historical Effects. This refers to any other specific events that may have occurred at the start of the study or during the study that may have produced the results [Reference 4, page 81]. A common problem in education research is that after successful change on some objective, such as grades or behavior, scientists and school administrators do not closely examine all other major changes that occurred during the same time period as the evaluated new program.

Historical effects are very unlikely to have caused the gains in academic performance or the 95% reduction in antisocial behavior in the Anthony School Eat, Exercise, and Excel Program. The school administration made a conscience commitment before implementation to avoid any other changes that might impact academic performance, behavior, or obesity during the entire school year. Other ideas were simply put on hold for one academic year.

Statistical Regression. This is “the tendency of groups that have been selected for study on the basis of extreme high or low scores to regress or move toward the mean or average on second testing” [Reference 4, page 83]. Regression toward the mean is unlikely the cause of the success in the Anthony School Eat, Exercise, and Excel Program for multiple reasons on academic performance or the antisocial behavior. In 2002-2003 63.8% of the students met federal “at risk” standards, but during the second year of intervention that rose to 84%. This increase has been trending upward for three years and traditionally “at-risk” is inversely correlated with both behavior and academic performance.

Antisocial behavior. When antisocial behavior is measured monthly in U.S. schools a distinct pattern emerges. Antisocial behavior is lowest during the first two months of the school year in the fall, gradually rises during the academic year, and then rises sharply during April, May, and June, but falls back to the same level as the previous fall during the new academic year [6]. Thus, if a comparison was made of only spring and fall antisocial behavior rates, nearly every school would report superior behavior in the fall. That type of analysis was not done at Anthony. A comparison was made of the average rate of antisocial behavior for the 2002-3 and 2003-4 academic years and antisocial behavior was 95% lower during the second year. Antisocial behavior was almost non-existent during the fall and crept up slightly in late spring producing an annual average reduction of 95%. In the fall of the second year of implementation, again antisocial behavior was 95% below pre-intervention levels and has remained constant.

Regression to the mean was eliminated as a possibility by simply choosing a long enough time period to see if the target problem area ever returned to pre-intervention levels. Since it did not, the results cannot be considered due to statistical regression. There is a second reason why regression to the mean is not plausible. When monthly disciplinary rates vary they tend to produce a wave-like curve with some months being

slightly higher and others slightly lower. The reduction in disciplinary actions is supposed to regress toward the average, not cross the average and go to the opposite edge of the wave. Thus, statistical regression is not consistent with the findings and is ruled out as a possibility.

Math and English scores. Regression toward the mean is unlikely (but not impossible) for the remarkable improvement in both academic areas. These scores are recorded annually on the standardized Kansas Assessment tests instead of monthly. Schools that excel one year are likely to “slip” back toward the average the next year due to regression toward the mean and schools at the bottom are likely to rise modestly the next year due to regression. If regression was the reason for gains in academic performance, the school’s academic rank from 8th should have been about half way to average (i.e. 5th) ending the year at 6th, not 1st.

Rising from 8th to 1st in one subject and to 2nd in the other is not consistent with regression. Like the change in antisocial behavior, these gains are simply too large to be attributed to the phenomenon called regression toward the mean.

Instrumentation. This “involves changes in the measuring instrument from the beginning or first period of evaluation to the second, later, or final evaluation,” [Reference 4, page 83]. This is the third most common “rival causal factor” to explain educational program success as it occasionally happens on education tests. When scores are unacceptably low, some institutions produce fictional gains by making the tests easier. Likewise, teachers could change their standards for when to refer students to the principal’s office for discipline. Instrumentation issues do not seem to apply to this program.

Math and English scores. There is no chance that the improvement in grades was due to the state making the Kansas Assessment tests easier last year. This possibility was eliminated by comparing Anthony academic performance to the other schools performance in the district. Since any changes in the instrument, (increased or decreased difficulty), would be constant at all schools, the effects of any such change would be eliminated by only making between-school comparisons in which rank in performance was compared.

On the other hand, closer examination of no child failing the Math test requires closer scrutiny. The fact that this remarkable phenomenon was not reported by any of the other schools in the district adds weight to the claim that this program not only worked well, but exceeded all expectations.

Antisocial behavior. Modest changes in school violence and disciplinary referrals could be due to changes in instrumentation where teachers or administrators use slightly different standards after a new program is implemented. The latter did not appear to occur as major efforts were made by the principal to keep her standards and record keeping consistent and the number of referrals received by the principal still dropped 95%. Change in some individual teacher decision-making concerning whether

to make a disciplinary referral is the more likely instrumentation problem, if one existed. This may occur when: (a) massive staff turnover occurs and the replacement staff has different standards or (b) a few individual teachers attempt to “help” the program work by not referring students. The second type has its own name, Pygmalion effects. There was an atypical instrumentation change by the teachers. As behavior improved drastically, new stricter norms gradually developed. Thus, incidents during the later part of the study were often for behaviors that would not have resulted in disciplinary during the baseline year. In effect, reverse instrumentation occurred making the changes all the more dramatic.

The first is not believed to have occurred for two reasons. First, there was no massive staff turnover; replacement hires were minimal. Second, the use of substitute teachers fell slightly as permanent staff used less sick days. It is well known that substitutes are likely to face more disciplinary problems than permanent teachers as students “test” what the limits are. However, the difference in substitute use is too small to account for much variance in antisocial behavior.

Pygmalion effects are not believed to have occurred for two reasons. First, historical analysis shows that staff who must maintain control to perform their duties do not tend to change their norms as to when administrative discipline is sought [5]. This study implemented dietary changes and the staff was not told to expect improved behavior. At debriefing every staff member reported they were surprised to see violence fall after implementation so none could have attempted to “help” the results. The second reason is even more persuasive. When staff attempt to help a new program, (and the results are therefore artificial), the results eventually wear off and antisocial behavior returns to pre-intervention levels. Institutions that have used such dietary changes have reported long term permanent improvements in behavior making this concern at worst, minor, and most likely, irrelevant.

In short, no evidence could be found that would suggest the reduction in antisocial behavior were due to instrumentation change by the teachers or principal.

Maturation effects. This “refers to biological or psychological changes in the respondents during the course of study that are not due to the experimental variable,” [Reference 4, page 82]. Primary and elementary schoolchildren show remarkable change over short periods of time, much faster than high school students. Experienced educators can distinguish the difference in disciplinary problems and control of second and fourth graders with ease. This raises the question of whether the improvements in conduct and grades might have been due to simple maturation. The answer is no.

Math and English Scores. The improvement in rank can not be due to maturation effects. All students in grade 4 were tested on Math and all students in grade 5 were tested on English. In effect, there was a single test given once to each child preventing the possibility of any maturation effect. The comparisons were then made of 5th graders between schools and 4th graders between schools. This creates a different potential confounding problem, namely, were the students at each school equivalent academically

in the year before implementation? The answer is no. They were no equivalent in academics during the baseline year. Statistical regression would thus be likely to raise the Anthony scores from 10th slightly, but not to 1st and 2nd in Math and English. Thus, there is no evidence of maturation or regression accounting for these gains.

Antisocial behavior. Maturation is a serious potential confounding factor with antisocial behavior of children. Experienced educators recognize that classroom control and disciplinary problems get worse not better during grades one through seven, become the worse during junior high (grades seven and eight) and then maturation in conduct gradually appears throughout the high school years in terms of minor disciplinary problems. In contrast, based on FBI data serious offenses (i.e., felonies) are almost non-existent before age 8 or 9 and increase until age 17 [7]. These factors were considered and controlled. Maturation effects were not a factor since there was no substantial change at Anthony in the number of students enrolled in any grade and the reduction in antisocial behavior was constant across all grades.

Testing Effects. Many studies pre-test the students in a control and experimental group to ensure equivalence at the start of a study. Testing effects “refers to the bias and foreknowledge introduced to respondents as a result of having been pretested.” This is not a factor since students were not pretested in either Math, English, or antisocial behavior.

Selection Bias. This “occurs when the researcher chooses nonequivalent groups for comparison,” [Reference 4, page 84]. This was probably the greatest potential threat to the validity of the study and care had to be taken to avoid it. For example, it would be unfair to compare change in disciplinary acts at Anthony with change in disciplinary acts at the other schools that had comparatively little disciplinary problems. The “control” group schools had relatively little room for reductions in antisocial behavior given their lower quantity during the baseline year. The better comparison was a monthly rate at Anthony during the baseline and intervention years which scientifically is called a quasi-experimental time-series design that avoids selection bias. [1].

Experimental Mortality. The loss of participants in a longitudinal study over time is referred to as experimental mortality [Reference 4, page 84]. It can be a serious problem when many of the worst behaved students leave during the experimental time-period but few left during the baseline time period. No evidence of this has been found. Just like instruction worked against the study, the same can be said for experimental mortality. Anthony staff found themselves admitting students who had been expelled from the other elementary schools due to the favorable reputation Anthony was developing.

Selection-Maturation Interaction. Even though none of the above seven areas of concern may account for program change, the interaction between them or a combination of them may bring about the obtained results in some studies. For example, one study did not control for age (selection bias) or spot a potential maturation effect when older delinquents were treated elsewhere and later found that the reduction in

antisocial behavior could be explained by these two factors [Reference 4, page 84]. This type of confound does not appear to exist since neither age nor maturation is a factor.

Summary concerning eight variables related to internal validity. This study has considered the possibility of historical effects, maturation effects, testing effects, instrumentation changes, statistical regression, selection bias, experimental mortality, and selection-maturation interaction as alternative explanations for the reductions in antisocial behavior and increase in academic performance. No evidence was found that any of these considerations contributed significantly to the remarkable improvements made in the Anthony Eat, Exercise, and Excel Program.

The next section deals with the issue of external validity. This addresses the question of to what extent can the results at Anthony confidently be generalized to other schools and school districts? The primary issues to be reviewed here, according to Stanley and Campbell, are: (a) selection bias; (b) testing effects; (c) reactivity or awareness of being studied; and (d) multiple-treatment interference.

Section 4: Variables Related to External Validity and the ability to Generalize

Selection Bias. This is the greatest threat to the external validity of the study. By external validity, we mean in what other situations would this program produce similar results? It is axiomatic that the greater the differences between Anthony and other institutions, the greater the risk of producing different results; conversely, the greater the similarities, the greater the chances of producing identical results.

We believe the most relevant characteristics of Anthony include its multi-racial student makeup; students in pre-Kindergarten through grade five; a high percentage of children with one parent absent from home (incarcerated in Leavenworth Federal Prison); location in a modest sized city with 10 schools; and location in an area with a high transient population.

The more obvious questions are whether such programs would generalize to older students in junior and senior high schools and whether they would generalize to major metropolitan cities.

Testing Effects. As stated before, the absence of pre-testing of students eliminates this as a confounding factor.

Multiple-Treatment Interference. This occurs when more than one treatment variable is used on the same subjects [Reference 4, page 86]. In this study, each component of the program could be viewed as a separate treatment, (i.e., nutrition, exercise, and curriculum changes). Whether this is a problem or not depends on the eye of the beholder. If we treat the evaluation through the eyes of a school administrator, most would be interested in the degree to which the entire program works and the costs of each component. However, the scientist who is primarily interested in causation would

likely be troubled by so many components within the program and ask the question of which part(s) caused the improvements. This is a legitimate question, but impossible to answer since all parts of the program started concurrently rather than consecutively. Still, it is worthy to list the major components that are likely to have had some effect.

The school district created the program with a literature search of evaluated programs that had been able to reduce school violence and antisocial behavior and then created this program by taking various parts from other institutions. The cornerstone of the program was a daily multiple vitamin-mineral supplement containing approximately the US Recommended Daily Allowances of all vitamins and most minerals for which an RDA exists. (The exceptions were calcium and magnesium, which were in lower amounts than the RDA due to bulk). The primary difference between these chewable tablets and other supplements was a base made out of foods containing trace phytonutrients, the same things found in similar quantities in a diet of fruits, vegetables, and whole grains. The second major component was an increase in the physical education program in terms of frequency and type. What makes the Anthony Project unique is the psychological component of improving self-esteem as a part of the physical education component. A third factor is the reliance upon county nutrition services to share with the teachers the latest nutrition information so healthy eating could be incorporated into the curriculum at all grades. A fourth factor is creating of a “new food” day each week in which students were taught to try new foods to expand knowledge on what they liked and did not. This increases variety of food intake, which is a component of good nutrition. A fifth factor was moving meals from the cafeteria to the classroom which undoubtedly contributed to less antisocial behavior since cafeterias are prime locations for antisocial behavior. Since each of these components started together, there is no way empirically to unravel how much each contributed to the total improvements. This makes the Anthony project a successful educational program rather than a single variable scientific experiment.

Reactivity or Awareness of Being Studied. This means that the subjects, or participants, (i.e., students, teachers, staff, administration) are aware of what is supposed to happen. It is described as “placebo effect” when referring to the students, Pygmalion effects when referring to teachers, staff, administration, or researchers, and generically as Hawthorne effect [2]. There are only two ways to cure this type of confounding interference.

One is a different research design that is experimental rather than quasi-experimental [1]. Ideally a sample of students is pre-tested, randomly assigned to a control and experimental group with equal pre-test scores, intervention then starts in the experimental group only, and then post-testing is done with a check to make sure that no one knew whether any student was in the control or experimental group. This type of study cannot be done on the Anthony Program since it becomes obvious as to who is eating in the cafeteria or the classroom and who is getting the extra exercise. However, such designs have been done using supplements and placebos successfully on youths aged 6-12 years [5, 6], 13-17 years [5,8] and 18 to 25 years [5,9]. The children given supplements produced nearly a 50% reduction in antisocial behavior and massive gains in

academic performance, but not as much as the Anthony program. This is to be expected. Only one of these experimental studies included a food education component and none included the emphasis on exercise and self-esteem, which surely contributed to the program.

The second way to eliminate placebo, Pygmalion, or Hawthorne effects is to evaluate the program long term [1]. There is no such thing as a permanent psychological effect. Either the gains are sustained or not. This is the only way to practically evaluate such programs. The length of this program has restricted the probability of any of these effects being significant.

A third procedure was suggested as early as 1983 and implemented only once in a research design, a quasi-experimental interrupted time series design in which a correctional institution went back and forth repeatedly from a broader to a narrower diet [10]. Every time the diet was broadened to make it healthier, antisocial behavior fell significantly and every time diet was restricted, antisocial behavior rose. Institutional administrators however have been understandably hesitant to return to a previous diet when they knew that more problems existed at that time making long term evaluation the most pragmatic design.

Section 5: Discussion Conclusion and Recommendations

Discussion. The approach taken here is somewhat novel, but well grounded in science. The vitamin-mineral program component impacting behavior, academics, and intelligence had already been demonstrated in clinical studies, published in the scientific literature and attempted in school settings [5, 6, 8, 9, 11-13]. It should hardly be surprising to find results in this type of applied research that are consistent with the results of well-controlled clinical studies.

Conclusions. Making sure that children are well nourished at school by the use of supplements, nutritional education, quality food with variety, and regular exercise in school settings has immediate impact within days on the conduct of schoolchildren, allowing teachers to maintain control in the classroom and focus on education. It also follows that well-fed healthier children will do much better on academic performance tests.

Recommendations. These findings are simply too important to be ignored. Different recommendations follow for different institutions.

For schools, the obvious answer is to import as much of this program as possible for as long a period as necessary to assess the impact on behavior and eventually academic performance. A three-month pilot study should amply demonstrate the behavioral benefits that any district could expect.

For state and federal agencies, research funds are needed to support schools who wish to try this approach and to Universities who wish to find out why it works. Perhaps the entire program is necessary, or perhaps only a few of its component parts are critical, but without systematic study of each part, it is difficult to be certain why it works, and what additive or synergistic effects between the components exist.

What is clear is that the bulk of funds need to be administered to Districts that want safer schools and better grades now, and do not wish to wait years for pure academic research. There is room for both school application with evaluation and pure University research as to causation.

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