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## **Featured Articles:**

### ***EVALUATION MODEL OF THE TURABO MATHEMATICS AND SCIENCE PARTNERSHIP PROJECT***

Dr. Oscar A. Sáenz and Prof. Mylord Reyes Tosta

4

### ***CARDIOVASCULAR DISEASE PREVENTION: INTERNET RESOURCES FOR A TEACHING UNIT***

Prof. Aldo T. Marrocco

22

### ***SPANISH TRANSLATION AND CULTURAL ADAPTATION OF THE ADOLESCENT PSYCHOSOCIAL SEIZURE INVENTORY IN PUERTO RICO: IDENTIFICATION OF THE PSYCHOSOCIAL PROBLEMS IN AN EPILEPTIC GROUP***

Dr. Flordeliz Serpa

33



# FEATURED ARTICLES

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## EVALUATION MODEL OF THE TURABO MATHEMATICS AND SCIENCE PARTNERSHIP PROJECT

Dr. Oscar A. Sáenz and Prof. Mylord Reyes Tosta

### Abstract

The Evaluation Model of the Turabo Mathematics and Science Partnership (AMCT, Spanish acronym) Project combines external and internal evaluation. The external evaluation is composed of three phases: Pre-Evaluation, Evaluation, and Post-Evaluation. The model uses a mixed evaluation approach, it includes a quantitative, as well as, a qualitative focus, and it includes formative and summative evaluations. Descriptive and inferential parametric statistics are utilized in the summative evaluation, following a quasi-experimental design with a comparison group (control group). The AMCT Evaluation Model considers objectives achievement, process improvement and change, learning, quality of implementation, increase of teachers' content knowledge, support for change in the instructional practices in the classroom, and effect on the students' academic achievement. The model has been empirically tested during two years, the 2007-2008 and the 2008-2009 cycles of the project execution.

**Key words:** evaluation model, formative evaluation, summative evaluation.

### Resumen

El Modelo de Evaluación del Proyecto de la Alianza de Matemáticas y Ciencias del Turabo (AMCT) combina la evaluación interna y externa. La evaluación externa está compuesta de tres fases: Pre-Evaluación, Evaluación y Pos-Evaluación. El modelo usa la evaluación mixta, incluye métodos cuantitativos, así como, cualitativos e incluye evaluación formativa y sumativa. Estadísticas descriptivas e inferenciales son utilizadas en la evaluación sumativa, siguiendo un diseño cuasi-experimental con grupo de comparación (grupo control). El Modelo de Evaluación de la AMCT considera el logro de los objetivos, proceso, mejoramiento y cambio, aprendizaje, calidad de la implantación, aumento del conocimiento de contenido de los maestros, apoyo para el cambio en las prácticas de enseñanza en la sala de clases y efecto en el aprovechamiento académico de los estudiantes. El modelo ha sido probado empíricamente durante dos años, los ciclos de ejecución del proyecto 2007-2008 y 2008-2009.

**Palabras claves:** modelo de evaluación, evaluación formativa, evaluación sumativa.

## INTRODUCTION

This article presents the structure of the evaluation model used in the Alianza de Matemáticas y Ciencias del Turabo (AMCT, Spanish acronym) or Turabo Mathematics and Science Partnership Project. It starts with a description of the AMCT Project, followed by a literature review regarding the evaluation of professional development projects for teachers. Then, the AMCT evaluation model, the research design and methodology for impact evaluation, and the conclusions are presented.

## THE AMCT PROJECT

The Alianza de Matemáticas y Ciencias del Turabo (AMCT) is a professional development program for science and math teachers who teach elementary (4<sup>th</sup> through 6<sup>th</sup>) and middle school (7<sup>th</sup> through 9<sup>th</sup>) at public and private schools in the educational region of Caguas, Puerto Rico. The ultimate goal of the program is to increase the academic achievement of the students taught by the participating teachers. The AMCT is organized within the Universidad del Turabo (UT) and comprises three schools, Engineering, Science and Technology, and Education. It is sponsored, via the Department of Education of Puerto Rico, by funds from the Mathematics and Science Partnership, Title II-B, Section 2202 of the “No Child Left Behind Act” of 2001, of the U.S. Department of Education. Said sponsorship is provided through yearly projects, the first of which began in 2004. The Project’s components are a) content trainings in math or science, b) in-school support for the design of activities learned in the trainings, c) scholarships for courses at UT, and e) educational materials. Beginning in the academic year 2008-2009, a new component was developed, action research, and volunteer teachers and their respective students had the opportunity to apply the scientific method and reflect upon teaching-learning methods. Figure 1 presents the main components of the AMCT project. Tables 1 and 2 show the evolution of the Project in terms of the amount of participating teachers, based on subject, level, public or private school, and amount of training hours.

Figure 1. Components and Processes of the AMCT

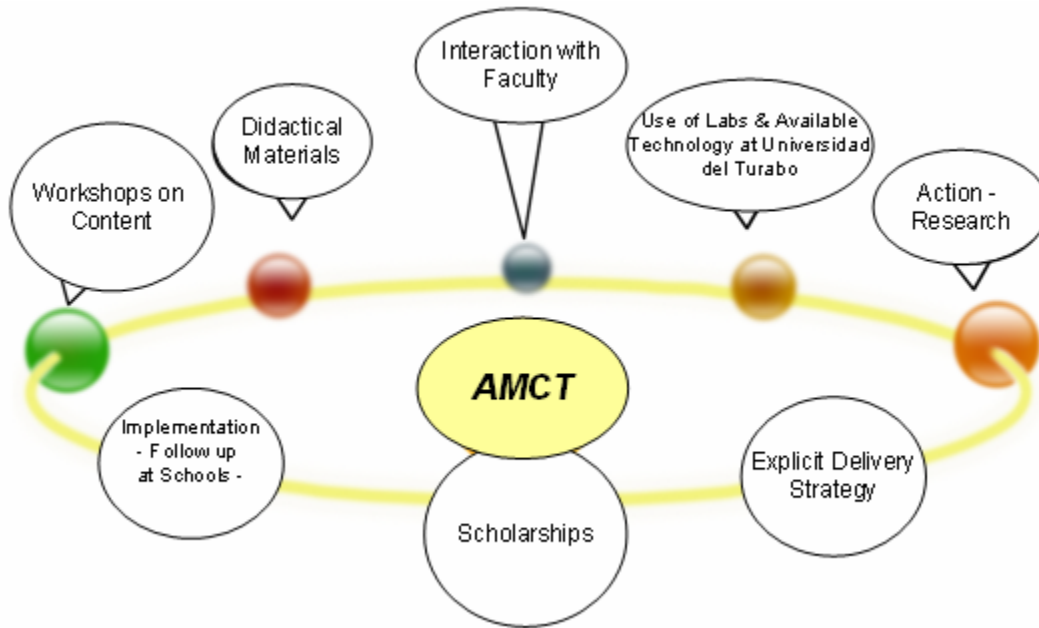


Table 1. Participants by Year, Level, Training Hours, and School Type

Year	Number of Participants*	Level	Training Hours
2004-2005	70	Middle School	120
2006-2007	97	Middle School	120
2007-2008	125	Middle School	140
2008-2009	100	Middle & Elementary School (4 <sup>th</sup> to 9 <sup>th</sup> )	160
2009-2010	70	Middle & Elementary School (4 <sup>th</sup> to 9 <sup>th</sup> )	160

\* Funding for this number of participants

Table 2. Composition of Participants for 2008-2009

Area		Level		School Type	
Math Teachers	Science Teachers	Middle School Level	Elementary Level	Public Schools	Private Schools
79	62	71	70	110	31

## PROFESSIONAL DEVELOPMENT EVALUATION MODELS REVIEW

According to Yoon et al. [1], who revised more than 1,300 research studies related to the impact of professional development on the students' academic achievement, the way to find out about the efficiency and efficacy of educational programs is by evaluating them. Only nine studies provided proof that they complied with the standards established by What Works Clearinghouse (WWC), an agency administered by the Science Education Institute of the U.S. Department of Education. Noted is the lack of rigorous research that directly evaluates the effect of teachers' professional development in terms of how it serves the

Noted is the lack of rigorous research that directly evaluates the effect of teachers' professional development...

students' academic achievement, particularly, in the fields of math, science, and language. A common problem was the research design, in particular, the quasi-experimental, which presented problems related to the equivalence between the experimental and control groups. The report revealed that the students of the teachers who received the professional development during an average of 49 hours (in the nine studies) increased their achievement by approximately 21 percentage points.

Furthermore, Livingston et al. [2] stated that the external evaluation is frequently perceived by the teachers as a form of control and criticism of their work. On the other hand, the internal evaluation carried out by the school seems to be considered a professional development process that contributes to the improvement of the teaching staff and the learning process of the students. However, it must be taken into account that

if the evaluation model is not suitable, if it has problems in design, if its execution is not ethical and, in addition, if mathematical and statistical errors are committed, the results of the evaluation are neither valid nor trustworthy.

Blank et al. [3] revised 25 programs of professional development for math and science teachers from schools in the United States. The four criteria considered in the revision were: 1) the quality of the implementation, 2) an upgrade in the content knowledge of the teachers, 3) a change in the educational practices in the classroom, and 4) the effects of the professional development on the students. The primary findings were the following:

- a) Of the 25 programs, 20 project directors submitted evaluation reports and only 18 of those reports had specific findings relating to the four criteria analyzed in that revision.
- b) Thirteen programs reported quality in the implementation of the professional development activities.
- c) Twelve evaluation reports included data regarding an increase in the content knowledge of the teachers.
- d) Twelve reported changes in the educational practices.
- e) Twelve programs achieved an increase in the academic achievement of the students.

According to Blank et al. [3], nearly 50% of the programs were able to provide evidence of a positive change in the content knowledge of teachers and students. These results coincide with those expressed by Yoon et al. [1] in terms of the lack of valid and reliable scientific evaluations of many professional development programs in math and science.

A year later, Blank et al. [4] analyzed the findings of the evaluations of the 25 professional development programs for math and science teachers in 14 states. These authors reported that, among other things:

- a) Seven of the studies reported measurement of the effect of the teachers' professional development activities on the results of the students' academic achievement.
- b) Ten of the studies reported measurement of the increase in the teachers' content knowledge and four reported measurement of the effects of the teachers' teaching practices.

- c) Those programs that reported an increase in content knowledge in math and science exposed the teachers to 50 hours or more of content training.
- d) Only one third of the programs carried out evaluations that were based on scientific research designs, which produced findings based on the measurement of the effects on student achievement and changes in teaching practices.
- e) Nearly 25% of the programs included a comparison between an experimental group and a control group.
- f) Four of the programs implemented adequate instruments for data collection and analysis to compare teaching practices in the classroom, by utilizing teacher samples.

On the other hand, Capacity [5], which for evaluation purposes supports projects and programs sponsored by the National Science Foundation (NSF), has developed an evaluation model known as “Context-Sensitive Evaluation Model Development”. This model attempts to involve all the participants in the educational process in order to

...many projects do not carry out evaluations and, even when they do, they rarely use techniques and criteria that are accepted by the experts in the field.

incorporate relevant factors that promote meaningful results in educational reform, which are often overlooked. Among these, there are: implementation strategies, results of the teachers’ and students’ scholarship, choice of professional careers in math and science, and an adequate dissemination of evaluation

models and their results among the projects. The latter is of utmost importance for the Consortium for Building Evaluation Capacity (CBEC), which states that many projects do not carry out evaluations and that, even when they do, they rarely use techniques and criteria that are accepted by the experts in the field. It also expresses that some existing evaluation models cannot easily accommodate the current intricacies of the educational programs and their reforms. Another situation that is criticized is that, even while there are evaluation models that can be disseminated, other projects (math, science and technology, and STEM) do not take them into account in order to improve the present ones.

The Expert Science Teaching Educational Evaluation Model (ESTEEM) presented by Burry-Stock [6] of the University of Alabama, established evaluation instruments that have their philosophical roots in the teacher’s duty to provide the best

environment and the best method in support of the students' learning process. In their research, they adopted the model developed by Michael Scriven, called "Evaluation Model Based on the Teachers' Duties;" this includes five categories: (1) Content knowledge of the subject; (2) Teachings skills; (3) Assessment skills; (4) Professionalism and (5) Other contributions to the school. They stated that this model serves as a foundation for the use of various methods of evaluating teachers, such as: peer evaluation, external evaluation, and self-evaluation. However, they realized that the main hurdle was the lack of information regarding the criteria used to consider the expertise of the teachers.

... is very important that the professional development evaluations be focused on a better understanding of what influences the teachers' knowledge and documents its impact on the content knowledge of the students.

Lowden [7] stated that few research have documented their impact, expenses and effects, and that, frequently, professional development evaluations only evaluate the participants' satisfaction and/or opinions in terms of their experiences during the learning process. He added that it is very important that the professional development evaluations be focused on a better understanding of what influences the teachers' knowledge and documents its impact on the content knowledge of the students. His affirmations coincide with those (aforementioned) of Burry-Stock, Capacity, Yoon, Blank and Livingston.

Lowden [7] also presented Thomas R. Guskey's evaluation model, which includes five levels for the gathering of information with regard to professional development and are structured hierarchically from simple to complex. The five levels are: 1) Reactions of the participants, 2) The participants' learning, 3) Organization, help and change, 4) Use of new abilities and knowledge, and 5) Results of student learning. According to Lowden [7], this model abides by all the considerations for an appropriate evaluation. The AMCT evaluation model coincides with four (1, 2, 4, and 5) of the levels of Guskey's model.

Guskey also stated that:

- If an evaluation is planned more carefully, not only will the evaluation process be easier, but it will also be better directed toward an effective professional development.



- Many leaders avoid carrying out systematic evaluations for fear of not passing the test. That is, they fear that the evaluation will reflect that their work is not focused on improving the students' learning.
- In certain aspects of the allocation of funds for the No Child Left Behind Act (NCLB), the federal government finds itself frustrated because it can neither see nor control its outcome.
- In the past, teachers have often planned the professional development based on what is new and critical, more than on what they should know in order to work with, help, and teach their students.
- In the NCLB Act, the federal government imposes specific requirements so that the teachers only consider programs and innovations that are "scientifically-based research." Teachers should now verify whether research is what is behind these programs and innovations. They should make sure that the research comes from reliable sources, particularly, from peer-reviewed articles; they should establish that the programs have been applied in a wide variety of contexts, and that their effects have been evaluated by third persons. Dr. Guskey also said that he has met with leaders from the Department of Education and from various philanthropic organizations who have suggested that he consider changes in the content of the proposals so that they may be more specific in terms of whatever relates to evaluation.

ICVET [8] presented four models that evaluate professional development called 1) Donald Kirkpatrick and Thomas Guskey, 2) Anona Armstrong, 3) Zita Unger and Anthea Rutter, and 4) Program Logic. Regarding the Kirkpatrick and Guskey model, which is based on a four-level evaluation structure, it has survived more than 30 years of development in the field of evaluation. The first three levels are centered in trainings, reactions, learning, and changes in behavior. The fourth element refers to benefits and organizational results. This model served as a basis for Guskey's (aforementioned), who expanded it with questionnaires and proformas. Anona Armstrong's model is also based on Kirkpatrick and Guskey. In its first phase, it proposes four levels for the program's design, where it reviews the criteria, procedures, and results of the evaluation. As a second phase, it proposes an evaluation setting that contains the criteria to be evaluated,

the procedure for the collection and analysis of data, along with its results. Armstrong's model evaluates the program's design and proceeds with a very detailed and specific evaluation procedure, concluding with an analysis that includes such variables as productivity and quality.

Zita Unger and Anthea Rutter developed a model in which the training needs are aligned with the need for profitability. It is called Strategic Training Evaluation Model (STEM), also known as Investment Return. It is based on determining the information needs for the board of directors for each of the stages of the professional development training, their different prospects, and their perceptions regarding the investment in each stage. Once this is done, the STEM process is used to help in the alignment of the training needs with the need for profitability, and evaluates the contribution of the trainings and development in order to achieve the objectives. In this case, the importance given to the return on the investment is supported by the fact that each board of directors or key staff member has something specific in mind that defines the success or failure of the program. This constitutes its investment (e.g., experience, time, prestige, money, and credibility) in the training events. The evaluation strategy of this model seeks to extract information of the measurement and impact of these variables.

The Logical Program Model is recommended because of its usefulness in the development of an understanding of the critical elements in a program's operation. This model's structure revolves around work-based learning. It begins with an analysis of the program, identifying the program's logic, making it explicit. The essence of a logical program is the premise used to create an explicit scheme of the causal relationship among the program's components. In this model, the starting point is thinking about what the program aims to achieve. The hierarchy begins from the lowest level of the program's activities and its performance at various levels. Then, the intermediate and final results follow. The cardinal objective of this hierarchy is to show the correlation between performance and results. The hierarchy of results helps identify which needs are in first place before reaching the second step, the cause/effect relation and/or the contingency relationships.

Hanley et al. [9] designed the “Transition of Change Model” to evaluate professional development programs. It is a model focused more on exploring the processes of a program than on the results of an intervention. The authors contend that this model provides a rational framework to conceptualize and evaluate changes that take place throughout a variety of organizational agencies in the program. The four components that the model explores are: 1) the duties of the agent of change, 2) expression of the program’s vision, 3) people’s transition and commitment to the vision, and 4) maintenance and renewal of change. This model adopted the guidelines of the Guskey Model with regard to improvement in professional development.

A noteworthy aspect of the AMCT Model is that the external evaluation contributes not only to the formative and summative evaluation, but also includes pre-evaluation, thus, becoming involved in the process from the outset of the Program...

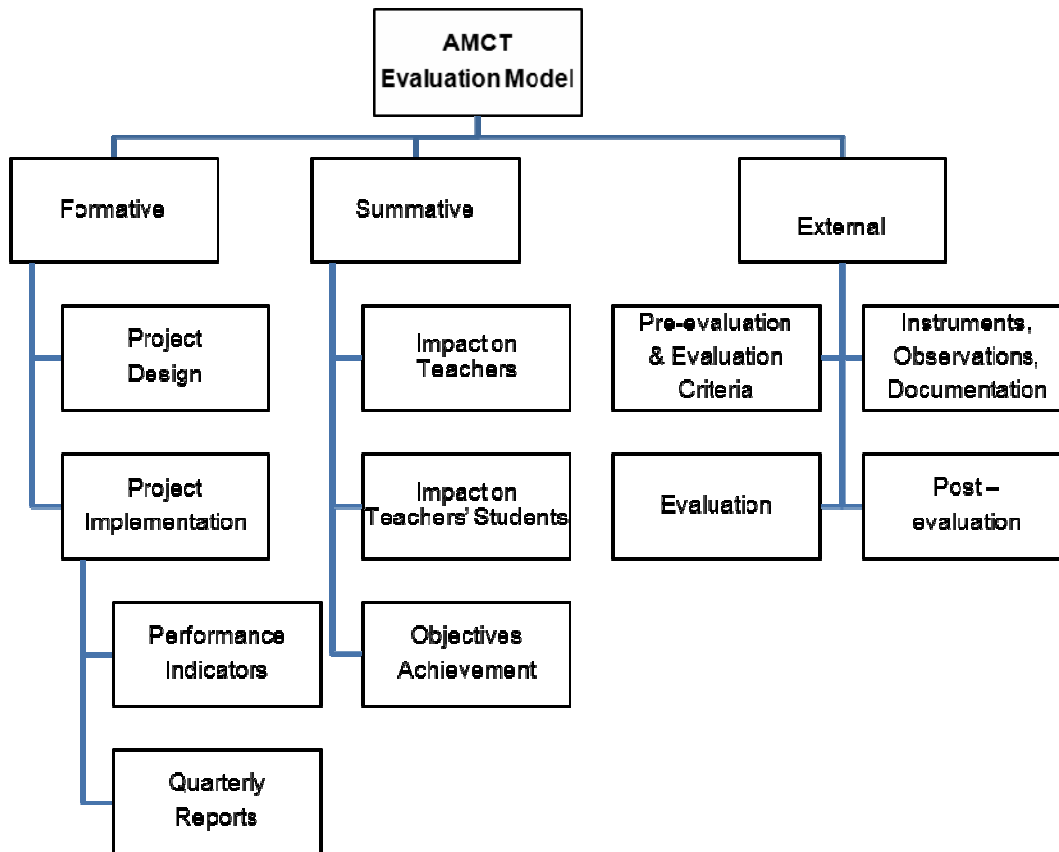
Caracelli [10] states that there should be a change in the evaluation processes geared toward educational accountability that involves measurement of results or efficiency. The federal evaluations rely on studies with mixed method designs that are able to provide evidence or reliable results. On the other hand, Frechtling [11] states that the evaluation is suitable in order to determine whether the objectives, goals, and purposes have been achieved. Furthermore, the

information that is acquired should facilitate the course of action to be taken. If the results are positive, the program’s continuation is justified, as long as an appropriate updating is carried out. If the results are negative, measures are taken to correct, radically change, or discontinue the program.

## THE AMCT EVALUATION MODEL

The AMCT Evaluation Model (Figure 2) is a mixed model. It contains quantitative and qualitative elements, internal and external evaluation, and formative and summative evaluation. A noteworthy aspect of the AMCT Model is that the external evaluation contributes not only to the formative and summative evaluation, but also includes pre-evaluation, thus, becoming involved in the process from the outset of the Program, through the inspection of the work plan, and then, based on the work plan, establishing its own evaluation plan.

Figure 2. AMCT Evaluation Model



### **Formative Evaluation and Project Monitoring**

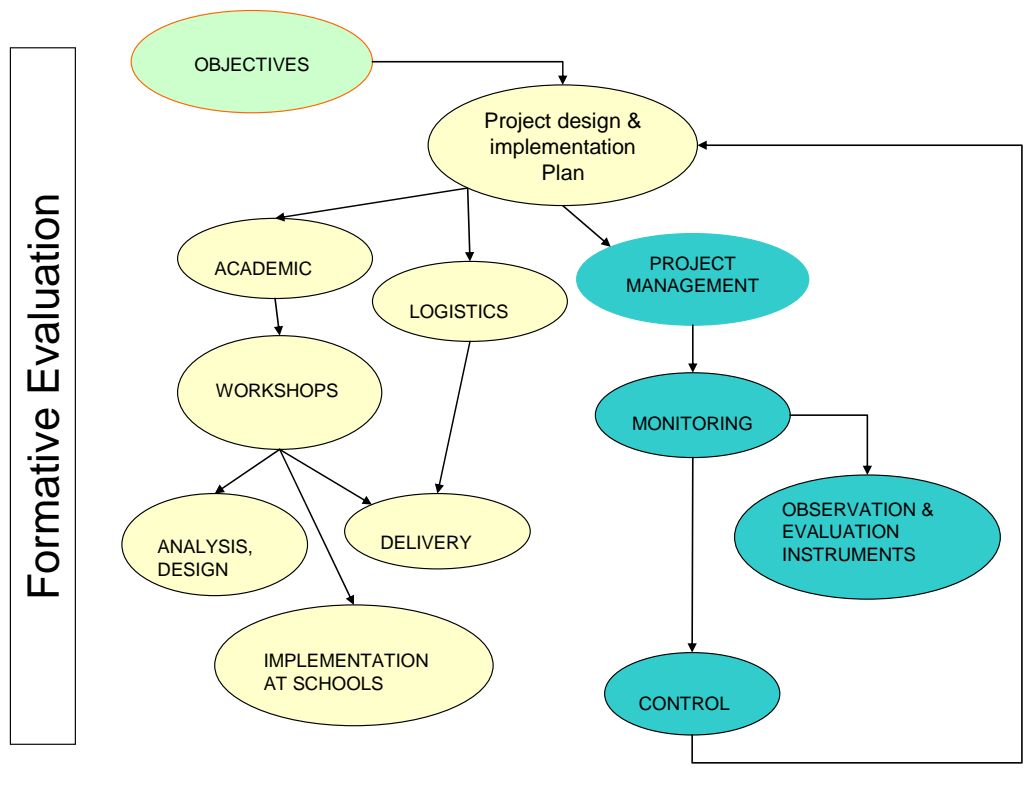
In the formative evaluation, the model begins with an examination of the Project's objectives. Said objectives are the basis of the design and general project. The formative evaluation is focused on two aspects: accountability and control of the Project. As part of the formative evaluation:

- Each activity, as well as, its relationship to the Project's objectives, is scrutinized.
- The activities carried out were monitored in order to determine whether they were conducted as expected and in a timely manner. This practice represents the link with the Project's management.

- Along with the formative evaluation, control of the Project is carried out, which represents a key factor for the design and implementation of corrective measures towards the achievement of the Project's objectives. Particular emphasis is given to the control of the critical activities, those that could delay the Project's execution or otherwise affect the achievement of the objectives.

Figure 3 presents a conceptual map with the main elements considered in the formative evaluation.

Figure 3. Formative Evaluation



The Project used various instruments for the formative evaluation (Table 3), which were designed to evaluate the Project's main activities and objectives. Two mechanisms of particular interest for continuous improvement were:

- The workshop evaluations, where the participants evaluate the quality of each training session, and
- The self-evaluation meetings carried out by the Project's staff following the training sessions, where, whenever necessary, the reasons for which a particular activity may have deviated from the original plan are scrutinized.

Table 3. Formative Evaluation Instruments

<b>Instrument/Mechanism</b>	<b>Administered</b>	<b>Type of Evaluation</b>	<b>Focus</b>
Protocol for math and science classroom observation	By External Evaluator to school teachers	External	Qualitative
Protocol for workshop observation	By External Evaluator during workshops	External	Qualitative
Protocol for structured interview with teachers	By External Evaluator	External	Qualitative
Project Evaluation Questionnaire	To teachers from experimental and control groups, AMCT Staff, Workshops Faculty, and Educational Advisors	External	Qualitative
Documents and activities revision form	To AMCT staff	External	Qualitative
Workshop evaluation sheet	To Participating Teachers	Internal	Qualitative
General Activity Evaluation Sheet	Experimental Group Teachers	Internal	Qualitative
Self-evaluation meetings (lessons learned)	Staff	Internal	Qualitative

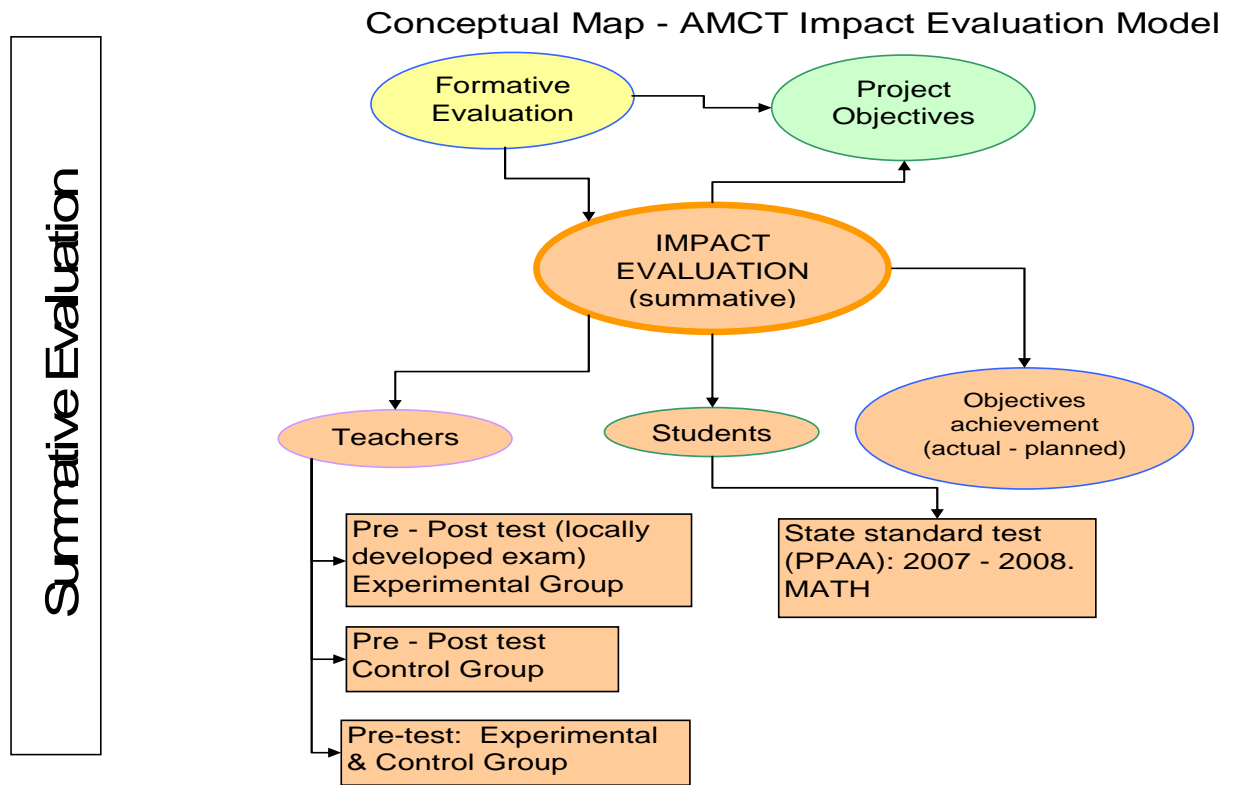
**Summative Evaluation**

The summative evaluation examines the achievement of the Project’s objectives and the Project’s impact in terms of:

- The academic achievement of the students of the participating teachers.
- The content command of the participating teachers.

Figure 4 shows the AMCT summative, or impact, evaluation model.

Figure 4. Summative Evaluation



The main instruments for summative evaluation (Table 4) were the state-standardized test (PPAA-Spanish acronym for Puerto Rican Test of Academic Achievement), which is given to the students by the Puerto Rico Department of Education, and the content test developed by the Project team and administered to the participating teachers. The Project’s test was tested in terms of validity and reliability in the following manner:

- Revised by a team of three of the Project's staff members: Director, Academic Director, and Research Director.
- Revised by a panel of three specialists, who are also teachers.
- After the first test (pre-test), those items found by the participating teachers to be questionable and, thus, subject to invalidation, were eliminated.
- For purposes of reliability, the test was given twice, as a pretest and a posttest, and the correlation between both was calculated.

Table 4. Summative Evaluation Instruments

<b>Instrument</b>	<b>Administered to</b>	<b>Type of Evaluation</b>	<b>Focus</b>
Content pretest and posttest Level: Middle School Subject: Mathematics	Teachers from experimental and control groups Level: Middle School Subject: Mathematics	Internal	Quantitative
Content pretest and posttest Level: Middle School Subject: Science	Teachers from experimental and control groups Level: Middle School Subject: Science	Internal	Quantitative
Content pretest and posttest Level: Elementary Subject: Mathematics	Teachers from experimental and control groups Level: Elementary Subject: Mathematics	Internal	Quantitative
Content pretest and posttest Level: Elementary Subject: Science	Teachers from experimental and control groups Level: Elementary Subject: Science	Internal	Quantitative
Puerto Rican Test of Academic Achievement (PPAA)*	Experimental Group's students	Internal	Quantitative
PPAA*	Control Group's students	Internal	Quantitative

\*Carried out by the Department of Education of Puerto Rico



## METHODOLOGY AND RESEARCH DESIGN FOR IMPACT EVALUATION

Two of the Project's objectives were to increase the content command of the participating teachers and to increase the content command of their students. The impact, or summative, evaluation measures increases through a research methodology based on a quasi-experimental design with matched comparison group. The comparison group, or control group, is very similar to the group that receives the intervention, or experimental group, in terms of participation requirements and demographic characteristics (both groups were made up of teachers from the same geographic region). Furthermore, the time period in which the two groups were studied was the same, as well as, the methods used to collect and analyze the data.

The impact evaluation was measured by four experiments, each with its own corresponding formulation and hypothesis testing (level of significance  $\alpha = 0.05$  and error type II,  $\beta < 0.2$ ):

- The first experiment seeks to prove that the intervention increases the participants' command of the content, through pretests and posttests on content given to the experimental group.
- The second experiment's objective is to demonstrate that the Project is the determining factor that causes the increase – if any – of the participants' command of the math and science content, through pretests and posttests given to the control group.
- The third experiment's objective is to show that, at the beginning of the Project, the experimental group's command of the content is not superior to the control group's command, by comparing the results of pretests given to both the experimental group and the control group.
- The fourth experiment examines whether there was an increase in the academic achievement of the participants' students, by comparing the results of the PPAA of the two most recent years.

## CONCLUSIONS

The AMCT Evaluation Model complies with the view of Caracelli [10] in terms of accountability, with Frechtling [11] in terms of goals and objectives achievement, with Hanley et al. [9] in terms of process improvement and change, with Lowden [7], who presented Guskey's model, in terms of considering participants' reactions and learning, support for changing and using the new knowledge and skills acquired during the AMCT trainings and, last but not least, with Blank et al. [3] that use the following criteria to revise math and science professional development programs: quality of implementation, increase of teachers' content knowledge, support for change in the instructional practices in the classroom, and effect on the students' academic achievement.

The Project's objectives are the basis of the AMCT Evaluation Model. The AMCT evaluation model was empirically tested and fine-tuned during two consecutive years. The timely application of the model has been instrumental in the Project's performance. The formative evaluation supports the Project's management, particularly, the control of the Project, in terms of making timely decisions in order to adjust the course of the Project, whenever necessary. The experimental design used in the summative evaluation allows for planning, in advance, the necessary activities and instrument design for the collection of information and hypothesis testing. The impact evaluation takes on its true dimension provided that the groundwork needed for its implementation is done at the outset of the Project. The structure for the evaluation model (i.e., formative and summative, qualitative and quantitative) allows for the tackling of the intricacies that are typical of the implementation of an educational project. A limitation of the model is the use of a state standardized test (i.e., the PPAA) which has changed throughout the years. Consequently, the results of such tests are not suitable for comparison from one year to another.

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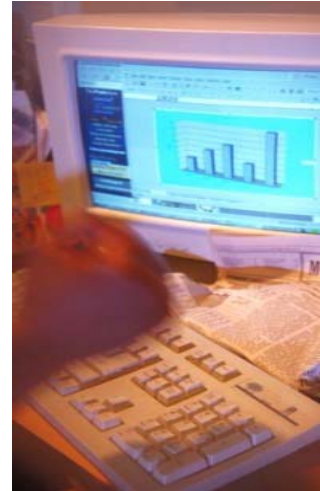
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# CARDIOVASCULAR DISEASE PREVENTION: INTERNET RESOURCES FOR A TEACHING UNIT

Prof. Aldo T. Marrocco

## INTRODUCTION

The need has been felt to find stimuli for getting young students interested in the subject “Health”, helping them to understand the importance of this gift, which nature has endowed them, in the optic of doing their best to preserve it. For this reason, internet resources had been searched such as scientific publications, atlases, images, graphics and animations that help study cardiovascular disease (CVD) prevention through a study route where a “health” culture is promoted in the widest sense.



According to the World Health Organization (WHO), cardiovascular diseases contributed to 16.7 million (29.2%) of total global deaths in 2003.<sup>1</sup> Also, at least 20 million survived CVD, therefore, requiring much clinical care. Most of the burden is attributed to stroke or myocardial infarction and four out of five of these deaths occurred in low- and middle-income countries.

## AIMS OF THE TEACHING UNIT

Since this subject is very complex, this paper is just an introduction to the study. Stroke and myocardial infarction are the starting point of an educational route toward an increased awareness of the consequences of our behavior on our health. These consequences can be positive or negative. The risk factors are determined, to a great extent, by behaviors learned in childhood and continued in adulthood such as dietary habits and smoking.

## MATERIALS AND METHODS

**S**ome documents from the WHO concerning CVD and their prevention, such as the Atlas of Heart Disease and Stroke<sup>2</sup> and the Tobacco Atlas<sup>3</sup> are available, including information about the situation in the world. Also, several online animations help to better understand the mechanisms of some CVD,<sup>4,5</sup> diabetes and its relationship with obesity,<sup>6,7</sup> and the relationship between salt and blood pressure (BP).<sup>8</sup>

An important resource for sanitary education is Pubmed, a free digital database of biomedical and life sciences journal literature which provides access to millions of papers.<sup>9,10</sup> The American Heart Association published a guideline (Primary Prevention of Ischemic Stroke), which contains 572 citations for further deepening.<sup>11</sup> In addition, the WHO published a document entitled “Avoiding heart attacks and strokes”.<sup>12</sup> These documents are the base of this manuscript.

This teaching unit may cut across Science, English, gymnastics and geography. When working in the classroom with students that have basic knowledge about anatomy and physiology, the computer was used for the research and the reading of these documents. Then, face to face explanations, discussion and verifications followed.

## DISCUSSION

**T**he stroke is a neurological deficit due to an interruption of cerebral blood flow, usually caused by a blockage or bleeding. Some of its risk factors are no modifiable; therefore, it is important to know them, since they identify who is at highest risk of stroke and who may benefit from rigorous prevention.

Factors such as aging, male gender and low birth weight (<2500 g) are statistically associated with greater risk. Other factors have some influence, including genetic and racial ones. A BP higher than 90/140 mm Hg is the first modifiable risk factor because the hypertension acting on the walls of the arteries can cause bleeding. However, many doctors advise, if possible, to have an even lower BP. To a certain level, hypertension is asymptomatic and many people have been undiagnosed.

A lower risk of stroke is associated with an increased consumption of fruits and vegetables. This applies to a lower sodium intake and an increased consumption of potassium as well. A diet not too rich in fat is generally associated with a lower risk.

Many studies have shown a direct relationship between physical inactivity and risk of stroke. Physical activity, even moderate, carried out on a daily basis for 30 minutes already provides a detectable benefit (Figure 1). Activities more intense and of longer duration, carried out gradually and under medical supervision, can provide greater benefits. Constant practice of physical activity reduces BP, blood levels of triglycerides, sugar and LDL cholesterol, and raises the blood level of HDL cholesterol. Further benefits are reduction of excess weight, stress and anxiety. It has been suggested that physically active students demonstrate higher performance at school and adopt more readily other healthy behaviors (avoiding alcohol, tobacco and drug use).

Figure 1. Example of cycle facility to promote physical activity



Considering all age groups, on average, tobacco use doubles the risk but for young people the increase of risk is even greater. Smoking can increase the effects of other risk factors. With women who neither smoke nor use oral contraceptives (OC) as reference group in one study, the risk of stroke was 1.3 times greater for smokers not using OC. The use of OC among non-smokers increased, on average, 2.1 times the risk of stroke. But when smokers used OC, it increased by 7.2 times showing a synergistic effect (the “expected” risk without interaction should have been about 2.7 times greater). This

happened in the past with the first generation of OC users. Today, with modern low-dose hormone OC, even assuming that the risk persists, it is considered very minor.

The relationship between use of alcohol and risk of stroke is expressed by a "J-shaped" curve. In particular, a low wine consumption is statistically associated with increased HDL cholesterol, reduced platelet aggregation, lower concentration of plasmatic fibrinogen and, therefore, a lower risk situation as compared to what happens in abstainers. High consumption of alcohol is very risky since it can lead to high BP, hypercoagulability, reduced cerebral blood flow and a greater likelihood of atrial fibrillation. Alcohol can induce dependence and its abuse is a major public health problem. In terms of education, alcohol is a very sensitive issue since notoriously other factors come into play such as dangerous driving, interactions with other substances, etc. Young people and pregnant women should particularly be beware of alcohol.

In terms of education, alcohol is a very sensitive issue since notoriously other factors come into play such as dangerous driving, interactions with other substances, etc.

The use of drugs, including cocaine, amphetamines and heroin, is associated with increased risk of stroke as it can lead to sudden changes of the BP, embolization, increased blood viscosity, aggregation of platelets and vascular changes. A study considering all the age groups showed that drug addiction increases the risk of stroke by 6.5 times. According to this study, but considering only the age groups below 35 years, the risk is 11.2 times greater, allowing us to understand how much more vulnerable are young people.

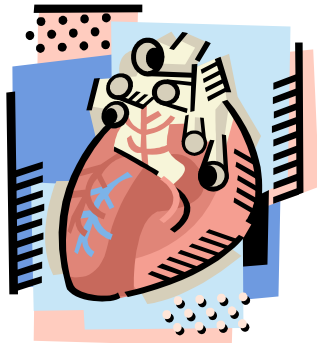
Among the pathologies associated with an increased risk of stroke is type 2 diabetes. It was observed that, in a group of diabetic patients with mean BP 87/154, the risk was 44% higher than in a group with mean BP 82/144.

Myocardial infarction is caused by an interruption of blood flow to the heart muscle. This is frequently caused by the accumulation of fatty deposits (atheroma) on the inner walls of the arteries. The arteries become more rigid and their section decreases, with increased likelihood that a possible blood clot blocks them. If a blockage takes place in the arteries of the brain, the stroke occurs; if it happens in the coronary arteries, the myocardial infarction is the consequence.

Overweight and obesity are statistically associated with a high CVD risk. The body mass index is calculated by dividing the weight in kilograms by the square of height in meters, ideally it should be between 18.5 and 24.9. A person is considered overweight when the index is between 25 and 29.9 and obese beyond this value. Abdominal obesity is achieved with waist circumference exceeding 102 cm for men and 88 cm for women. This is associated with the presence of visceral fat harmful for metabolism. In this regard, there are some differences among human races.

Type 2 diabetes is a metabolic disorder which hampers the release of glucose from the blood to the cells that use it. The result is a fasting glycemia too high, beyond 126 mg/dl (=7 mmol/l), that can accelerate the formation of atheroma resulting in narrower and harder arteries, with a greater risk of stroke and myocardial infarction. Diabetes, up to a certain level, is asymptomatic and many people do not know that they have it. Overweight, physical inactivity, a diet rich in fat and sugars but low in fiber, as well as abuse of alcohol favor it. Type 2 diabetes occurs generally among adults, but now the number of young people with this pathology is increasing in many countries.

According to the WHO, BP exceeding 90/140 mm Hg, besides damaging the arteries leads to a stressing situation for the heart. Overweight, smoking, alcohol abuse, salty foods, as well as physical inactivity increase BP. High levels of triglycerides (>150 mg/dl) and LDL cholesterol (>115 mg/dl), favor the formation of atheroma or plaques of cholesterol, with consequent CVD risks. The HDL cholesterol should exceed 40 mg/dl in men and 46 mg/dl in women; this is beneficial because it has the opposite effect than the LDL. Among the strategies set by the WHO for the prevention of CVD are:



1. Consuming limited amounts of foods containing saturated fats.
2. Eating omega-3 contained in certain fish and certain vegetable oils (remembering, however, that every fat, saturated or not, when taken in excessive amounts promotes overweight.)
3. Having a fiber rich diet hence oriented towards fruit, vegetables, legumes and whole grains.



4. Practicing a physical activity even moderate such as walking, housework or gardening, for at least 30 minutes a day, possibly continued on a daily basis. Physical inactivity increases the risk of coronary heart disease and ischemic stroke by around 1.5 times.

5. Avoiding smoking and abuse of alcohol. The risks are much higher in people who started smoking before the age of 16.

6. Maintaining a regular body weight. Obese children are very likely to remain obese into adulthood and to develop CVD and diabetes.

7. Limiting salty foods and sugar. Many preserved, canned, and prepared foods very often contain a lot of added salt; this notoriously raises BP. Generally, simple sugars, unlike the complex ones, are rapidly absorbed into the bloodstream and contribute to high postprandial blood glucose.

The glycemic index of a food indicates how quickly a given amount of sugars present therein, enters the bloodstream hence causing a more or less sharp increase in postprandial glycemia. Every food has its own index, depending on the type of fiber and of sugar it contains, on the acidity, which affects the stomach emptying rate, as well as on other components.

According to Kaye Foster-Powell et al. (2002) the index is influenced by industrial processes and the type of cooking method; even botanical differences (e.g. between different varieties of rice) explain different glycemic indexes.<sup>13</sup> A prolonged use of carbohydrate rich foods with high glycemic index is associated with an increased risk of type 2 diabetes and CVD.

A heavy workload, especially if coinciding with situations where the employee has little power to decide, according to Hintsanen Mirka et al. (2005), determines in the long period, in the most sensitive individuals, thickening of the carotid walls as a consequence of BP rise.<sup>14</sup> This is known to be associated with increased CVD risk.

The effect of yoga on risk factors for CVD was studied by Kyeongra (2007), reviewing 32 scientific papers published in recent decades.<sup>15</sup> Even observing that further research would be necessary, he concludes that this practice can produce benefits with regards to blood lipids, overweight, glycemia, and BP. After reviewing 150 papers, Kim and Heather (2007) confirm these conclusions adding that yoga can also reduce the

effects of stress, anxiety, depression, sleep disorders and other factors, further contributing to CVD prevention.<sup>16</sup> According to many yoga teachers, different positions may have therapeutic effects,<sup>17</sup> but in certain specific situations, there can be also contraindications.

The effect of laughter on blood sugar was observed by Hayashi et al. (2003).<sup>18</sup> On a group of volunteers, including 19 diabetic (type 2) not in therapy and 5 healthy individuals, glycemia was measured before and 2 hours after a meal of 500 kcal. The first day, after the meal, the volunteers attended a monotonous conference. The next day, after the meal, they attended a comic comedy that caused intense laughter. Both healthy individuals and those with diabetes, as expected, always had a rise in postprandial blood glucose, obviously sharper in the latter. But when they had attended the monotonous conference the glycemia rose by 6.8 mmol /l in diabetic and 2.0 mmol /l in healthy subjects, whereas in the case of comic comedy the blood glucose rose by only 4.3 mmol /l in diabetic and 1.2 mmol /l in healthy subjects. The authors attributed the difference to an accelerated consumption of glucose by the muscles involved in the action of laughing, but speculate that the laughter has also acted on the neuroendocrine system limiting the rise of glycemia.

Some countries are facing the double burden of obesity and malnutrition.

According to the WHO, childhood obesity is an epidemic concerning Industrial and Third World countries, at least for certain population groups.<sup>19</sup> Some countries are facing the double burden of obesity and malnutrition. The WHO provides much guidance on how to deal with this in schools. The suggestions included the use of school garden to develop awareness about food origins<sup>20,21</sup> and safe non-motorized modes of transportation from house to school are encouraged as well (Figures 2 and 3).<sup>22,23</sup> An initiative that goes in this direction is the project "Walking Bus" popular in several countries. Children walk to school in groups according to fixed routes, meeting points and timetables, accompanied by trained volunteers. Municipalities and/or local sanitary institutions may support it. Students perform physical activity, learn to move correctly in the town and contribute to reducing traffic and pollution.

A teaching unit on CVD prevention may seem broad and demanding. It can be noted, however, that compliance with its rules often produces benefits on other areas of

health. For example, exercise also promotes bone development by reducing the risk of fractures. According to Karlsson et al. (2008), who reviewed 105 papers published on this topic, weight-bearing and impact activities stimulate an increase of bone mineral content in the skeletal parts involved in the exercises.<sup>24</sup> The results may have a different intensity depending on age, nutrition, sex, and, as for the exercises performed, their quality, quantity and frequency. Even the development of bone size is positively associated with physical activity.

Figure 2. Example of a segregated pedestrian lane to encourage safe, non-motorized modes of transportation and to promote physical activity



Figure 3. Example of a segregated pedestrian lane to encourage safe, non-motorized modes of transportation and to promote physical activity



A review by La Vecchia and Bosetti (2006) suggests that an alimentary style beneficial for the prevention of various cancers is very similar to that which prevents CVD.<sup>25</sup> According to a research conducted in 10 European countries with over 478,000 people by Norat et al. (2005), colorectal cancer is less common among people consuming

the largest amounts of fish.<sup>26</sup> The opposite occurs among people with the highest intake of red meat and preserved meat. This suggests similarities between the dietary habits which prevent colorectal cancer and a diet which prevents CVD. A document of the WHO focusing on prevention of cancer, in addition to emphasizing the importance of stopping the childhood obesity epidemic, provides further indications which still have many similarities with the ones which prevent CVD.<sup>27</sup> Intensive lifestyle changes with increase of CVD were observed in several countries during recent decades.

According to Ding and Malik (2008), in China, the prevalence of obesity, consequence of a diet with high glycemic index, rich in saturated fats, and less physical activity related to modernization, is contributing to the spread of diabetes and CVD risks.<sup>28</sup> According to Gill et al. (2002), in some countries of the western Pacific area, obesity and diabetes are rapidly spreading with consequent damage to the population.<sup>29</sup> The reasons given for this change are the abandonment of fishing and manual activities in agriculture, the diffusion of alcoholism and use of high fat foods, the frequent use of sugary drinks and cakes. In addition, the spread of private transport and violence discourages walking.

A project launched in North Karelia in 1972, as a response to the high mortality from CVD and then extended to the whole of Finland, according to Puska (2002) was the first one, among a series of projects based on the involvement of the whole community.<sup>30</sup> This activity, lasting 25 years, has involved various public services beyond the health institutions, schools, NGOs, mass media, supermarkets, food industries, agriculture, etc., even some environmental changes have been part of the strategy. The consumption of vegetal foods and fats, initially limited, became much more common; there was a decrease in the use of animal fat and total consumption of cigarettes. Physical activity during leisure time increased as well. As a result, among middle-aged men, there was a decrease of 73% in the annual rate of mortality for heart disease. The general conditions of health, in the adult population, improved and the mortality rate for lung cancer decreased by over 70%. Many other countries followed with similar aims.

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# **SPANISH TRANSLATION AND CULTURAL ADAPTATION OF THE ADOLESCENT PSYCHOSOCIAL SEIZURE INVENTORY IN PUERTO RICO: IDENTIFICATION OF THE PSYCHOSOCIAL PROBLEMS IN AN EPILEPTIC GROUP**

Dr. Flordeliz Serpa

## **Abstract**

The purpose of the study was to translate and culturally adapt the Adolescent Psychosocial Seizure Inventory (APSI) to the Spanish-speaking adolescent population and to identify psychosocial adjustment problems in adolescents with epilepsy. The sample consisted of 308 adolescents: 104 epileptic, 77 asthmatic, and 127 healthy. The subjects were active clients of public hospitals, private clinics, and a public high school. The APSI was translated from English into Spanish, adapted to the Puerto Rican adolescent population, reviewed by a bilingual panel of experts, and administered to the sample. A reliability analysis was performed and the reliability coefficient for the overall assessment was .97. It was concluded that the Spanish version of the APSI was statistically comparable to the original English version, establishing a basis for its use in the psychosocial assessment of Spanish-speaking epileptic adolescents in Puerto Rico. Finally, the results also revealed that the epileptic adolescents had more psychosocial problems than the other groups.

**Key words:** Adolescent Psychosocial Seizure Inventory, APSI, psychosocial adjustment, translation, cultural adaptation.

## **Resumen**

El propósito del estudio fue traducir y adaptar culturalmente el Adolescent Psychosocial Seizure Inventory (APSI) a la población adolescente de habla hispana e identificar los problemas de ajuste psicosocial en los adolescentes con epilepsia. La muestra consistió de 308 adolescentes: 104 epilépticos, 77 asmáticos y 127 saludables. Los sujetos eran clientes activos de hospitales públicos, clínicas privadas y una escuela superior pública. El APSI fue traducido de inglés a español, adaptado a la población de adolescentes puertorriqueños, revisado por un panel de expertos bilingüe y administrado a la muestra. Un análisis de confiabilidad fue realizado y el coeficiente de confiabilidad para el instrumento fue de .97. Se concluyó que la versión en español del APSI era estadísticamente comparable con la versión original en inglés, estableciendo la base para su uso en la evaluación psicosocial de los adolescentes epilépticos de habla hispana en Puerto Rico. Finalmente, los resultados también revelaron que los adolescentes epilépticos tienen más problemas psicosociales que los otros grupos.

**Palabras claves:** Adolescent Psychosocial Seizure Inventory, APSI, ajuste psicosocial, traducción, adaptación cultural.

## INTRODUCTION

According to the literature, there is evidence of a high incidence of psychosocial problems among epileptic adolescents,<sup>1</sup> particularly social, psychological, and behavioral problems.<sup>2</sup> It has been difficult to assess the psychosocial adjustment among epileptic adolescents. Several researchers stated that epileptic adolescents, as a group, have a higher incidence of psychiatric, psychological, and behavioral problems.<sup>3,4</sup>

Epileptic adolescents confront greater problems in their psychosocial adjustment.

Some studies addressed these problems and identified which adolescents with epilepsy were more susceptible to them.<sup>5,6</sup> The researchers explained that the presence of a chronic condition represented a series of problems at different levels in the daily living of the adolescents. The literature also presented that such a condition do not necessarily get to psychopathology but it does predispose the adolescents to many of the stressful factors in the environment. Thus, epileptic adolescents confront greater problems in their psychosocial adjustment. In addition, there were some problems that were very rarely evaluated, such as the adolescents' perception about their family and friends reaction to the convulsions and the epileptic adolescents' perception about social, scholar, and vocational restrictions.

The identification of problems in the psychosocial adjustment of epileptic adolescents provides crucial and fundamental information for the decision-making process in the planning and implementation of health programs and/or services for this group. The Adolescent Psychosocial Seizure Inventory (APSI) was used to identify the psychosocial problems of adolescents with epilepsy.<sup>1</sup> This questionnaire was developed by Batzel and was created after the Washington Psychosocial Seizure Inventory (WPSI), which is used to evaluate psychosocial problems in adults with epilepsy.<sup>4</sup> Although Spanish translations of the WPSI were available since its development, there was no evidence of a Spanish translation of the APSI. The main purpose of this study was to develop a reliable and valid Spanish version of the APSI. The specific objectives of this study were:

1. To translate the APSI from English into Spanish.



2. To culturally adapt the APSI for the Spanish-speaking epileptic adolescent population.
3. To identify the psychosocial adjustment problems in a group of epileptic adolescents through a comparative study with two other groups of adolescents (asthmatic and healthy).



## METHODOLOGY

The present study was conceptualized as a comparative study. The inclusion criteria for the sample were age between 15 and 18 years and attendance to regular classes at a regular school. For the adolescents with chronic conditions, diagnosis of epilepsy or asthma was also considered a criterion for inclusion. Adolescents with a physical, mental or emotionally disabling condition, such as mental retardation or a terminal disease were excluded. Participation in this study was completely voluntary and anonymous. Informed consent was obtained from the parents prior to the administration of the questionnaire to the sample.

Three questionnaires were utilized for the completion of this study. The first questionnaire was the APSI. This instrument was translated from English into Spanish and culturally adapted to the Puerto Rican adolescent population. This translation and cultural adaptation was reviewed by a bilingual panel of experts constituted by two neurologists, a psychologist, a social worker, and a health educator. After the Spanish translation and cultural adaptation of the APSI was performed, a pilot study was conducted. Nine epileptic adolescents, seven asthmatic adolescents, and eight healthy adolescents participated in this pilot study and completed the APSI. Based on the results of this pilot study, necessary modifications were made to the instrument before its final administration to the sample of the study.

The second questionnaire was developed by the principal investigator to collect information on independent variables such as age, sex, type of epilepsy, and age at onset. It also included eight open-ended questions about the adolescents' perception of the treatment received at the clinics, family support, and suggestions to help adolescents with

epilepsy as a group. The third questionnaire included seven open-ended questions and was designed to conduct a focus group with epileptic adolescents.

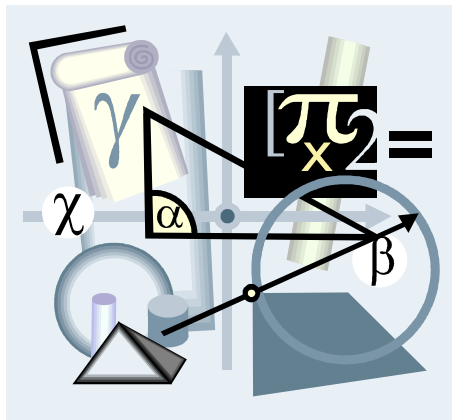
The Spanish translation of the APSI was administered to the adolescents. The study compared the psychosocial adjustment of the three groups: epileptic, asthmatic, and healthy. This study also assessed the psychosocial problems of the adolescents with epilepsy that needs to be considered in the planning and implementation of health care services and treatment modalities for this population in Puerto Rico. Psychosocial adjustment problems were identified and compared among the three groups by level of problem. There were four levels of problems in the psychosocial adjustment:

1. No significant problems
2. Possible problems but of limited significance
3. Distinct and definite difficulties impacting adaptability, and
4. Severe problems having a striking impact on adjustment

## RESULTS

**A** reliability analysis of the Spanish version of the APSI was performed. The psychosocial scales were found to be internally consistent. The standardized alpha for the scales was established at the .0001 level of significance. The reliability coefficients for the scales fluctuated from .49 to .93 and the reliability coefficient for the overall assessment was .97 (Table 1). The sociodemographic characteristics of the sample were determined through a frequency distribution (Table 2). The sample consisted of 308 adolescents: 104 epileptic, 77 asthmatic, and 127 healthy. Of the 308 subjects, 177 were female and 131 were male between 15 to 18 years old. All the subjects were Spanish-speaking, were randomly selected and were active clients of public hospitals, private clinics, and a public high school in Puerto Rico. Specifically, the epileptic adolescents were from the Epilepsy Association of Puerto Rico, the Municipal Hospital, the University Hospital, and private clinics. The asthmatic adolescents were selected from the Pediatric Hospital and private clinics. The sample of healthy adolescents was selected from a public high school in Puerto Rico.

A percentage distribution was used to compare the clinical variables of the sample (Table 3). Clinical variables included type of epilepsy, age of onset, control of condition, frequency of seizures or asthma attacks, and medication. In addition, a percentage distribution was used to identify problems in the adolescents' psychosocial adjustment and, also, to compare them among the three groups by level of problems. Table 4 presents the distribution of the four levels of problems in the psychosocial adjustment of the adolescents. The distribution shows only epileptic adolescents in the fourth level of problems (39%).



In order to determine differences among the groups, a chi-square distribution was utilized. The chi-square test performed to determine the differences between the epileptic and asthmatic groups showed a value of 45.56 ( $p$  value  $< .001$ ). The value of chi-square when the epileptic and healthy groups were compared was 88.71 ( $p$  value  $< .0001$ ). When the psychosocial adjustment was considered as a dichotomous variable (values 1 and 2

= absence of problems and values 3 and 4 = presence of problems), the distribution of the adolescents that showed problems in their psychosocial adjustment was the following: 82.3% in the epileptic group, 50% in the asthmatic group, and 29% in the healthy group. The epileptic group was identified as the group with more problems in the psychosocial adjustment followed by the asthmatic group. These results revealed that the epileptic adolescents showed a level of problems in their psychosocial adjustment much higher than the other groups.

Multiple regression analyses were performed in order to examine the contribution of the sociodemographic and clinical variables to the psychosocial adjustment of the epileptic and asthmatic adolescents groups. The multiple regression analysis applied to the healthy group included only sociodemographic variables. The variables that appeared to have a significant effect over the psychosocial adjustment in the epileptic group were chronological age, age at onset, and frequency of the seizures. This model explained 32% of the general psychosocial adjustment of the epileptic group.

A multiple regression analysis was performed in order to determine the degree of association between the psychosocial adjustment of the adolescents and the sociodemographic and/or clinical variables. Another percentage distribution was used to determine the adolescents' perception about family support and understanding, and the treatment program they were receiving.

For the asthmatic group, most of the sociodemographic and clinical variables appeared to have a significant effect on the psychosocial adjustment. These set of variables, except for presence of another health condition and frequency of the attacks, explained 76% of the psychosocial adjustment of the asthmatic group. Regarding the healthy group, none of the sociodemographic variables showed to have a significant effect on the psychosocial adjustment.

Table 1. Coefficients of Reliability of the Spanish Version of the APSI

<b>SCALE</b>	<b>STANDARDIZED ALPHA</b>
Family Background	.83
Emotional Adjustment	.93
Interpersonal Adjustment	.86
School Adjustment	.92
Vocational Perspective	.81
Adjustment to Seizures	.80
Medical Management	.67
Antisocial Activity	.49
Overall Psychosocial Functioning/Adjustment	.97

Table 2. Sociodemographic Variables of Sample

VARIABLE	GROUP					
	EPILEPTIC		ASTHMATIC		HEALTHY	
	N	%	N	%	N	%
<b>Sex</b>						
Female	55	53	43	56	79	62
Male	49	47	34	44	48	38
<b>Age</b>						
15	27	26	29	38	35	28
16	31	30	12	15	42	33
17	22	21	17	22	32	25
18	24	23	19	25	18	14
<b>Treatment Site</b>						
Public	70	67	51	66	39	31
Private	34	33	26	34	80	63
<b>TOTAL</b>	<b>104</b>	<b>100</b>	<b>77</b>	<b>100</b>	<b>127</b>	<b>100</b>

Note: Some of the percentages do not total 100% because some respondents did not answer all the questions.

Table 3. Clinical Variables of the Sample

VARIABLE	GROUP			
	EPILEPTIC		ASTHMATIC	
	N	%	N	%
<b>Type of Epilepsy</b>				
Partial	53	51	---	---
Generalized	51	49	---	---
<b>Age at Onset</b>				
Childhood	62	60	45	58
Adolescence	42	40	32	42
<b>Control</b>				
Good	50	48	25	33
Poor	54	52	52	67
<b>Frequency</b>				
High	46	44	8	10
Low	58	56	69	90
<b>Medication</b>				
Yes	102	98	71	92
No	2	2	6	8
<b>TOTAL 181</b>	<b>104</b>	<b>100</b>	<b>77</b>	<b>100</b>

Table 4. Distribution of Adolescents Per Level of Problems in Psychosocial Adjustment

LEVEL OF PROBLEMS 1=Low...4=High	GROUP					
	EPILEPTIC		ASTHMATIC		HEALTHY	
	N	%	N	%	N	%
First	4	4	26	34	60	47
Second	14	14	12	16	30	24
Third	45	43	39	50	37	29
Fourth	41	39	0	0	0	0
<b>TOTAL</b>	<b>104</b>	<b>100</b>	<b>77</b>	<b>100</b>	<b>127</b>	<b>100</b>

Comparison	X <sup>2</sup>	(p Value)
Epileptic vs. Asthmatic	45.56	(.000)
Epileptic vs. Healthy	88.71	(.000)

## DISCUSSION

The results of this study suggested that the information about the presence of a chronic condition such as epilepsy, including details about variables such as frequency of seizures, age at onset, and control of condition, only provided part of the information explaining the psychosocial adjustment. Epileptic adolescents tend to have more problems in their psychosocial adjustment when compared with another group with a chronic condition and with a healthy group. One of the most important findings of this study was the identification of greater problems in the epileptic group.

Additionally, results from the study of Seindenberg et al. confirmed and supported previous findings that identified a high incidence of problems in the psychosocial adjustment, particularly in the scholar and social adjustment of epileptic adolescents.<sup>7</sup> Similar results were obtained by Viberg et al., who found that an epileptic adolescents group had more problems in the emotional and interpersonal adjustment than a group of non-epileptic adolescents.<sup>8</sup>

In the present study, both groups with chronic conditions showed more problems in the psychosocial adjustment than the healthy group. It was identified that 82.6% of the epileptic adolescents had problems in their psychosocial adjustment, 50% in the

Both groups with chronic conditions showed more problems in the psychosocial adjustment than the healthy group.

asthmatic group, and 29% in the healthy group. It was observed that the epileptic and asthmatic groups were very different when compared to the healthy group ( $X^2 = 88.71$ ,  $p$  value  $< .0001$ ;  $X^2 = 10.00$ ,  $p$  value =  $.002$ , respectively), and showed more problems in the psychosocial adjustment. It was also observed that these groups were different between themselves ( $X^2 = 45.56$ ,  $p$  value  $< .001$ ).

The results of the multiple regression analysis for the epileptic group suggested that the variables that apparently have a significant association with the psychosocial adjustment were chronological age, age at onset, frequency of the seizures, and the use of medications. These results were similar to those obtained by Dodrill et al.<sup>9</sup> These researchers studied five groups of epileptic patients. The five samples showed similar problems in their psychosocial adjustment regardless of the clinical characteristics of the patients and the treatment site. Similar findings were obtained by Seindenberg et al. and Hoare.<sup>7, 10</sup>

Regarding the clinical variables, the findings of this study coincided with those obtained by Hermann et al. about the type of epilepsy.<sup>5</sup> These authors concluded that the type of epilepsy was not associated to the psychosocial adjustment. About the frequency of the seizures and the control of the condition, it can be stated that the results of this study supported those obtained by Rutter et al. (in Hermann et al.) and Hoare.<sup>5, 10</sup> These investigators stated that the psychosocial adjustment of epileptic patients was associated with the frequency of the seizures and not with the control of the condition. In this study, the  $p$  value for the test of association between frequency of seizures and psychosocial adjustment was  $.0002$ .

On the other hand, the findings about medication contradicted those found by Rutter et al. (in Clements and Wallace).<sup>11</sup> These investigators did not find an association between the use of medication and the psychosocial adjustment. In the present study, it



was observed a beta of 33.92 ( $p$  value = .0008), suggesting that medication was associated with the presence of problems in the psychosocial adjustment.

Regarding the asthmatic group, the findings of this study suggested that many of the variables considered in the multiple regression models were associated with the psychosocial adjustment. The only two variables that apparently did not have a significant association with the psychosocial adjustment were presence of another health condition and the frequency of attacks. Lastly, the multiple regression model applied to the healthy group showed no important associations between the variables and the psychosocial adjustment.

## CONCLUSIONS

**T**his study provided important evidence regarding the reliability and validity of the Spanish version of the APSI. Based on the results, the Spanish version of the APSI was statistically comparable to the original English version.

This established a basis for its use in the psychosocial assessment of Spanish-speaking epileptic adolescents in Puerto Rico and in other Spanish-speaking populations after appropriate cultural adaptations.

The results of this study also suggested that adolescents with chronic conditions have more problems in their psychosocial adjustment. Psychosocial variables should be considered in the treatment program of adolescents with chronic conditions.

Psychosocial variables should be considered in the treatment program of adolescents with chronic conditions.

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