An Exercise Intervention based on the Chinese Modality
採用中國模式的推廣運動方法

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Abstract

Children become more and more sedentary spending long hours watching TV, playing video games, and interacting with computers instead of communicating with friends, parents and teachers. They struggle to keep themselves awake during the first hours or the school day because they go to bed late. This results in unproductive learning. However, physical activity conducted before school starts serves as a mood booster and a way to regenerate energy (recharge batteries). It helps students absorb and process class materials during the early morning hours. The main objective of this study was to implement an intervention of exercise and health education in school curriculum to improve children's lifestyle, nutrition, and sleep.

摘　要

現代的兒童出現肥胖情況愈來愈嚴重，導致身體產生疾病。因此，學校在處理學童肥胖問題的角色也愈來愈重要，本文嘗試探討中國學校常用的晨早體操鍛煉模式，對西方兒童的影響。

Introduction

The national news and statistics about the epidemics of child obesity in North America indicates that every second child is overweight and that 40% of students K-12 suffer from Type II diabetes (American Diabetes Association, 2007). In the United States 30% of the children and adolescents are identified as obese, their chances to develop type II diabetes are 14 to 16 greater than by the time they reach age 30, and their lifetime expectancy is shorten by 1 to 2 year (America Scores: Statistics on Child Obesity, 2007). Some schools change their meal menu and offer more athletic programs, but in reality the students who eat healthy are already active and are less at risk. Most schools place emphasis on academic excellence, allocate more class time to science at the cost of cutting Physical Education (PE) classes. Curriculum designers and school policy makers try to generate scholars by nourishing their brains; however, they often neglect the bodies. They often ignore the fact that if students are sick, have a weak immune system, or develop degenerative diseases, high grades are meaningless. Incidentally, the part that works with the prefrontal cortex and is involved complex cognitive operations, the cerebellum is not only in charge of muscle coordination but also takes part in executive functions, reasoning planning and organizing.

Background

Statistics shows that the rates of obesity and type-II diabetes over the last decade jumped in the United States from 15.4% to 25.6%, in China from 6.4% to 7.7%, and in Israel from 4.2% to 6.8% (Katler et al., 2007; Wang, Monteiro, & Pupkin, 2007). Denmark's obesity rate is the lowest in the world (6.5%) but not significantly different

than the one in Israel. The proposed intervention was based on two similar modalities, Chinese and Israeli.

China of today in respect to the paradigm of mind body connection, and wellness, diverts from the Republic of China (Ann Collins Obesity Reduction Program, 2007). Lenin clubs promoted physical activities in schools. Physical education and exercise were integrated as an interrelated aspect of Chinese dialectical materialism. Physical culture encompassed all forms of life. The purpose was to instill social values brought up by mind-body activities; calisthenics, Kong Fu, and martial arts (Lee, 1979).

After 1949 the National committee of physical education in the Republic of China adopted a standardized fitness program and applied it to the entire school system. In addition, the department of higher education institutionalized achievement tests. In 1956 the national committee of physical education developed guidelines for exercise and health. It included team work, leadership, production in study, good behavior, personal accomplishment and outstanding academic performance. Physical Education was a tool to socially support the communist government. It had a political orientation.

In 1958, the government broadcasted nationwide a physical fitness program to patriotic music with specific routines for children and adults. Routines were prepared for distinctive classifications of workers such as coal miners, pottery makes, drivers, salesmen and textile employees. The 10-minute state sponsored morning and afternoon detailed fitness program was mandatory in all factories, companies, institutions and labor fields (Maetozo, 1983). At the schools, students stayed 10 minuets for ¨mass¨ exercise performed to music, which took place in addition to the morning exercise program.

Once a day after a 2-class period, there was a 50 min physical education class: 5 min general announcement highlights of the workout, 10 min warm up, 20-25 core program, 5-10 min cool down. The physical education curriculum was targeted to cultivate students morally, intellectually, and physically. School textbooks addressed and promoted the indoctrination concern for the collective, self-reliance and cooperation. Everyone, the young, old, sick and healthy were expected to contribute to society (Xiang, Lee & Solmon, 1997).

In China of today there are some schools which keep this tradition. Children wake up at 6:00 AM to exercise and to perform mandatory chores. Breakfast is served at 7:00 AM before school initiates. After each academic class there is an exercise period of 10 minutes between that class and the next class. A 20-minute exercise is performed if the class contains two sequentive sessions up to a three 20-minute exercise periods each day. Normally, one of these exercise periods is devoted to eye exercises to prevent nearsightedness while the other sessions focus on major group muscles. Schools in China today are generally built as a series of classrooms around an open courtyard for the convenience of frequent exercise periods.

At the turn of the 20th century exercise was also an integral part of the Israeli pioneers' ideology. Participation in a fitness program and physical activities were encouraged for development of a healthy body and mind. Talmudic scholars (who lived more than 800 years ago) encouraged their students to keep a healthy mind within a healthy body. This promoted a strong immune system which defeated malaria, typhus, and built hardships. Careful attention was given to children´ health and physical education and coaching. In 1960, the Israeli sport and recreation authority (part of the ministry of education) was appointed to serve as a major impetus for improving physical activity in schools and communities. In 1971, the authority appointed a committee which published the following statement: "The aim of physical education as part of the general educational process is to develop and foster the physical fitness of the individual or contribute to his health to form a harmonious personality with proper social behavior and to prepare him to do efficiently his roles in the Israeli society in studies, work, defense, and leisure time" (Simri, 1989).

Israeli schools have been participating ordinarily in world's youth sport games; called Hapoel. Hapoel has been the primary sport organization of the nation with the largest number of clubs and members. The first games were in 1928 and were recognized by the International Sport Federation. From student-focus infrastructure, Hapoel became workers' (employees) championship for mass participation. It offered scheduled sporting events, and educational activities for members in their communities and work places.

Another largest world sporting events in its kind, besides the Olympic Games has been the Maccabiah games. Since 1932, the games have been open to all Jews around the world and have taken place every 4 years in the state of Israel. They are supervised by the International Sport Federation and have status similar to Regional Games such as the Pan American Games.

Similar to China, Israel prioritizes mass participation in educational enrichment programs, recreational activities, and athletics, beginning at a young age and continuing throughout the life span. Israel and China have national exercise routines and sporting events. Exercise appears to be the key for children's socialization and upbringing. It is vital for learning by wiring the central nervous system from birth to 12 years. According to Piaget, immense amount of information about the world largely is gained by moving through it.

Adding to that music, exercise benefits the mind by developing brain cells, circuits and systems that become interconnected. The interconnectedness provides more pathways to solve a given problem. Findings to date emphasize the advantage of music accompanying exercise for brain cognitive function in making children flexible in the way they approach and think about problems. They show tolerance to different points of view and ideas, openness, willingness to take intellectual risks and be exposed to new experiences. Since this involves the senso-motoric system: vision, touch, hearing, and a symbolic interpretation; it requires integrated planning, execution of what the child intended with what s/he got out of it.

Preliminary Studies

No preliminary empirical studies about the effectiveness of such an intervention program were conducted except for the one studied here. The idea of the program "Switch" (meaning change) was making a change. Switch has been independently funded by advocates who launched the intervention for the first time in 2002 at several schools across Israel. Statistically, annual evaluations show significant improvement in the measured indicators in comparison to control age groups.

Methods

Participants

Students (N = 70), girls (n = 35) and boys (n = 35) ages 6-13 from a school in central Israel were randomly selected and assigned into experimental and control groups.

Procedures

At the beginning of each morning, the teacher for the first class called a girl and a boy from an alphabetical role list to lead the routine. The physical portion of the intervention was a 10 min exercise routine made up with the PE teacher. Each class made its own unique exercise routine; constructed series of moves and chose the music. The Physical Education teacher encouraged students to contribute their own ideas to the routine, and cultivated it as their pride. No testing for the routine or for mastering the skill requirements took place.

The assessments pre and post intervention were:

1. Body composition (fat %)
2. Academic achievements (GPA)
3. Self-esteem scale (Rosenberg, 1989)
4. Incidents of type II diabetes (#)

At the end of every month there was a contest among classes on the routine chorography. The criteria were originality, creativity, and collaboration of classmates. The exercise routine had to be executed in a coordinated manner and the students had to help each other to perform successfully. The routines were ranked, with number 1 given to the best performance. Judges were representatives of the classes and were selected by their peers in blind elections. According to contest policy, a lower rank was given in cases where not everyone in the class participated. Ballots were in a special designed box and the winners were announced on the bulletin board located next to the box. The winners were the three first places. The prize was a one trip day of their choice (mountain biking, roughting, rock climbing, etc.).

Measurement Instruments

The accurate way to measure the effectiveness of the program was with following measurement instruments:

Body fat percentage

The results from three instruments were collected for reliability and convergent validity: bioelectrical impedence, skinfold caliper, and FatTrack.

(1) Bioelectrical Impedance

Fitness is affected by body fat percentage because muscle tissue is more compact than fat. A low-level electrical current is passed through the body and the "impedance", opposition to the flow of current, is measured. The signal travels quickly through lean tissue, which has a high percentage of water and is therefore a good conductor of electricity, and more slowly through fat, as fat has a lower percentage of water and is therefore a poor conductor of electricity. Bioelectrical Impedance devices use the information from this signal to calculate body fat percentage. Important rules to observe in order to make a more accurate calculation of the body fat are: not to eat or drink for 4 hours before the body fat measurement test, and not exercise for 12 hours before the test.

(2) Skinfold Caliper

Skinfold caliper pinches predetermined sites on the body. The tongs pinch the skin, pulling the fat away from the muscles and bones. A gauge on the calipers measures the thickness of that pinch. Females and males store their fat in quite different places, normally three sites are used:

(a) Waist, females: Horizontal, at the level of minimal abdominal width
Waist, males: Horizontal at the level of the navel
(b) Hips: Largest horizontal circumference around the hips
(c) Neck: Inferior to the larynx

A healthy male's body should be approximately 12 percent to 18 percent fat. A healthy female should be approximately 14 percent to 20 percent fat. The data are entered into calculators excel worksheet.

(3) FatTrack

FatTrack is a computerized skinfold caliper that is accurate down to the millimeter. It uses a patent pending "Floating Code Thickness Measuring System" that detects the smallest change. FatTrack stores each measurement in memory and then calculates body fat percentage for up to three individuals and has an "undo" function, and a "self-calibration" feature that maintains a lifetime measuring accuracy. It stores maximum and minimum thickness at each measuring site to monitor what is happening with body fat levels. FatTrack comes with complete detailed instructions and tips on how make measurements as accurate as possible.

Grade Point Average

Evaluations can be expressed quantifiably, and calculated into a numeric grade point average (GPA). The concept of grading students' work quantitatively was first implemented by the University of Cambridge in 1792. The most commonly used quality index in the U.S. educational system uses five letter grades. Historically, the grades were A, B, C, D, and F – "A" being the highest and "F", denoting failure. In the mid-twentieth century, many American educational institutions - especially in the Midwest (particularly the State of Michigan) - began to use the letters A, B, C, D, and E. The only difference was that failure was denoted by "E" instead of "F". Apart from law schools, graduate schools in some states award the grade "D", despite having a 3.0 degree pass standard - measured against.

American high schools typically require a 1.0 grade point average to qualify to take a diploma. The industry standard for undergraduate institutions is a minimum 2.0 average. Most graduate schools have required a 3.0 grade point average since 1975, some schools still have 2.75 as their pass standard.

Level 4 = A or excellent (exceeds provincial standard, 80%-100%)
Level 3 = B or good (meets provincial standard, 70%-79%)
Level 2 = C or average (approaches provincial standard, 60%-69%)
Level 1 = D or poor (well below provincial standard, 50%-59%)
Level 0 = F or failing (remedial action necessary, 0%-49%)

In objective subjects such as mathematics, grades are normally computed according to percentages such as class attendance, homework completion, and test averages. A weighted average of these variables is used to compute one percentage, which is the index from which grades are determined.

American high schools and Universities sometimes weigh their GPAs. In subjective disciplines where essay exams and papers are more common, grades are sometimes represented numerically, other times with letter grades.

A = 80 or higher
B = 70-79
C = 60-69
D = 50-59
F = 49 or lower

The pluses and minuses are taken into account also, so a plus is closer to the higher end of the score or the minus is at the lower end of the score. The percentage system is not used in primary and elemnetary schools, as all marks shown on tests, assignments and on the report card are shown with the A-F or 0-4 system. Percentage may also be provided along with tests. In secondary schools, tests and assignments are provided with both the mark on the present system and also with the percentage. On the report card, only the percentage is shown on the final mark.

Incidents of Type II Diabetes

The number of students diagnosed by their physician as having type II diabetes was counted (Dong, 2005).

The Self-Esteem Scale (Rosenberg, 1989)

The Rosenberg Self-Esteem Scale is perhaps the most widely-used self-esteem measure in social science research. It is permitted to use for educational and professional research, and has been translated into many languages. The scale is a ten item Likert scale with items answered on a four point scale - from strongly agrees to strongly disagree. 1. Scoring: SA=3, A=2, D=1, SD=0. Items with an asterisk are reverse scored, that is, SA=0, A=1, D=2, SD=3. The total score is the sum the scores for the 10 items. The higher the score, the higher the self esteem (Rosenberg, 1989).

1. On the whole, I am satisfied with myself.
   SA A D SD
2.* At times, I think I am no good at all.
   SA A D SD
3. I feel that I have a number of good qualities.
   SA A D SD
4. I am able to do things as well as most other people.
   SA A D SD
5.* I feel I do not have much to be proud of.
   SA A D SD
6.* I certainly feel useless at times.
   SA A D SD
7. I feel that I'm a person of worth, at least on an equal plane with others.
   SA A D SD
8.* I wish I could have more respect for myself.
   SA A D SD
9.* All in all, I am inclined to feel that I am a failure.
   SA A D SD
10. I take a positive attitude toward myself.
   SA A D SD

Results

The immediate and direct benefits of the program were development of leadership and creativity, alert and focused students. Educationally, the program affected all academic areas. For example, in science, students learned what was the healthiest way (as opposed to the fastest way) to get to school. They determined whether walking, biking, riding the bus, joining to a car pool, taking a shuttle, would be their best choice. In math, students selected the most nourished way as opposed to the economist way to spend money for their school meals. They compared menus for certain amount of dollar and managed their budget. The students exercised arithmetic procedures: fractions, multiplication, subtraction, and division, in problem solving of health and fitness related contents. Continuing benefits of the program were installment of life long healthy habits of well being.

There was an overall gradual increase in the GPA and self esteem scores, and a decrease in body fat percentage and incidents of type II diabetes, except for the first 3 months and at the end of the 1st year where a plateau was reached. However, since self esteem is a subjective measurement, the improvement may not be quite equivalent to the objective measurements, GPA, body composition and incidents of type II diabetes (Rosenberg, 1965; Wylie, 1974).

The explicit results of the intervention were: enhanced academic performance, minimized prevalence of obesity and type II diabetes, reduced incidents of students' misbehavior and teachers' difficulty of class

management. The implicit aims of the intervention are: reduced healthcare cost, hospitalization, and medications intake, adoption of an active lifestyle and smart choices, acquisition of social skills, achieving a well-rounded students (mentally, physically, and emotionally), with high self-esteem and confidence.

On the body composition test, girls participating in the program had lowered their body fat 6% on average, from 27% pretest to 21% posttest. Boys participating in the program had lowered their body fat 5% on average, from 23% pretest to 18% posttest. The control group did not change; girls pretest and posttest had 28%, and boys pretest and posttest had 22% body fat. Girls participating in the program increased their GPA from 3.2 to 3.7. Boys participating in the program increased their GPA from 3.0 pretest to 3.5 posttest. The control group did not change; boys and girls averaged 3.1 on pre and post tests. On the self Esteem Scale students participating in the program scored 9 prior to the program indicating low self esteem compared to 27 indicating high self-esteem at the end of the program. The control group scored 11 pretest and 13 posttest with no significant improvement in self-esteem.

The parental evaluation of the intervention program

	Negative	Positive								
		Little		Somewhat			Effective		Very	
	Ineffective	+1	+2	+3	+4	+5	+6	+7	+8	+9
Reducing the incidence/severity of type II diabetes										9
Diagnosing correctly and constructing individualized treatment plan								7		
Improving information processing									8	
Providing the best solution for the child										9
Abstaining from medications									8	
Resulting in reliable outcomes when used consistently										9
Challenging and having clear objectives										9
Resulting in better understanding of weight management										9
Fitting to age group										9
Preparing for the future								7		
Providing valid and practical tools									8	
Offering a support system										9
Improving problem solving and decision making										9
Eliminating school bullying and mocking									8	
Offering variation, flexibility, and adjustment									8	
Preventing depression, anxiety, and aggression								7		
Reducing embarrassment								7		
Teaching social, motor, spatial, and thinking skills										9
Educating and involving parents									8	
Improving conversational and emotional expression									8	
Improving quality of life and awareness										9
Improving concentration and attention								7		
Improving working memory								7		
Improving kinesthetic and proprioceptives (location of body boundaries)								7		
Improving coordination and fine motor skills									8	
Improving self efficacy and self-care										9

Discussion

In China, an Asian country with a remarkably different cultural heritage than Israel or the United States, there is a greater emphasis on the importance of exercise in the individual self-growth and development, intrapersonal harmony, balanced life, and co-operation, at school, work, home, and business. Exercise is considered to be an instrument to prepare for life after school, although the educational systems can be selective and competitive. American and Chinese students can be best discriminated with respect to their goal orientation (Duda & Nicholls, 1992). Xiang, Lee, and Solmon (1997) compared Chinese (N = 180) and American (N = 207) elementary students' satisfaction on the Physical Education Scale. Students were asked to rate themselves on physical activities in which they were involved in class. The ego orientation loadings were positive for the Americans and negative for the Chinese. Ego orientation is the belief that success is a direct result of high ability. In contrary, Chinese students had a stronger task orientation; were more likely to work hard and put effort for success, show an intrinsic interest in learning activities, preferred challenging tasks and risk taking, used effective learning and problem solving strategies, and perceived higher competence for themselves. Americans were focused more on success in term of social comparison. It is task orientation that is associated with a variety of motivational variables that are likely to enhance long-term and high quality engagement in learning and behaviors. In contrary to ego orientation, task orientation is more likely to be associated with persistence in the face of difficulty, positive motivational patterns of intrinsic satisfaction, and enjoyment (Crandal, 1973; Duda, 1992; Walling & Duda, 1995). Research on attitude towards exercise in American schools indicates that for American students being on a sport team is more important than being a good student. Leung, Maehr, and Harisch (1993) found that American students viewed "getting good grades" or "doing better than others" as a measure of success. In contrary, Chinese students viewed "behaving well" as a measure of success. Israeli students are predominantly influenced by the United States, and are close in their goal orientation to that of the Americans (American Scores Data Inc., 2007). Their attitude may explain the improvement in GPA and self-esteem scores as a result of participating in the "Switch" program.

In Israel, PE classes take place twice a week. The average amount of active time is less than 25% of class time and it goes even further down for overweight children, who limit their mobility (Jewish Community Online, 2007). The latter, are usually shy and embarrassed to exercise in public feared of being ridiculed for failures. Many of these students seek an exempt requested by a parent, or create medical scenario to allow them refrain from physical activities. Negative experiences in PE classes ends the road for any future attempts to intervene with physical education later in life. "Switch" cured the potential damage by attaining the desired objectives and eliminating testing. Students in "Switch" reported they felt they were part of something, unified in attaining their objectives, they sensed approval, consensus, belonging, empathy and recognition. They described the program in terms of intrinsic rewards and self-fulfillment (e.g. play time, fun, excitement). They said: "losing weight was not the primary reason for doing it." They said the program helped with their stress. Switch is now recommended in the entire Israeli school system. In the United States only private schools have the flexibility to negotiate their curriculum and teaching agenda, and it requires parents' agreement.

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