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ORIGINAL

EVALUATION OF STRATEGIES FOR THE PHYSICAL ACTIVITY PROMOTION: COST-UTILITY STUDY

EVALUACIÓN DE ESTRATEGIAS PARA LA PROMOCIÓN DE LA ACTIVIDAD FÍSICA: COSTO-UTILIDAD

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ABSTRACT

The aim was to compare the additional cost by Quality Adjusted Life Years (QALY) gained from three strategies for physical activity promotion and verify

the interventions influence on the percentage of physically active adults in Basic Health Units (BHU). BHU users were randomized into three groups: (a) brief counseling - received guidelines to increase physical activity (PA) time; (b) indication group to the supervised physical exercise program - was invited to participate in the physical exercise program at the BHU; and, (c) evaluation group – didn't receive any type of intervention and only answered the questionnaires proposed by the research. The individuals in the three groups were interviewed in five moments, during a year, being evaluated on the cost by QALY gained and PA time. The strategy of brief counseling was more effective when compared to the other strategies, due to the lower cost/QALY and indication of positive results on PA.

KEY WORDS: Physical Activity, Counseling, Primary Health Care and Brazil.

RESUMEN

El objetivo fue comparar el costo adicional por Años de Vida Ajustados por Calidad (AVAC) de tres estrategias para promoción de Actividad Física (AF) y verificar la influencia de las intervenciones sobre el porcentaje de adultos físicamente activos en las Unidades de Salud Básicas (USB). Los usuarios de las USB fueron seleccionados y distribuidos en grupos aleatorizados: (1) breve asesoramiento - recibió orientaciones para aumentar la AF; (2) grupo de indicación al programa de ejercicio físico supervisado - invitados a participar en programa de ejercicio físico en la USB; y, (3) grupo evaluación - no recibió ninguna intervención, respondiendo a los cuestionarios propuestos por la investigación. Los grupos fueron entrevistados en cinco momentos, durante un año, evaluados sobre el costo por AVAC ganado y tiempo de AF. La estrategia de breve asesoría fue más efectiva, comparada a las demás estrategias, debido al menor costo/AVAC y resultados positivos sobre la AF.

PALABRAS-CLAVE: Actividad Física, Asesoramiento, Atención Primaria en Salud y Brasil.

INTRODUCTION

It is estimated that 31% of the world population and 45,1% of Brazilians do not reach the recommendations for the practice of physical activity[1,2]. The inclusion of physical activity strategies in the Public System of Primary Health Care (PHC) is adopted by high-income countries to combat physical inactivity[3]. In Brazil, there are community programs, among them, the offer of classes of supervised physical exercise in Basic Health Units (BHU) and counseling programs[4], however, little is known about the cost-utility of these actions.

Cost-utility analysis promotes a unit of measurement called QALY, known as quality-adjusted life years, which incorporates both quality of life (morbidity) and quantity of life (mortality). The data can be obtained using some techniques or questionnaires validated for the country of application. Thus, when calculating the cost of the health intervention/procedure plus the QALY variable, it is

possible to carry out the cost-utility analysis. This type of analysis is used to compare and verify the effectiveness between two or more health interventions/procedures[5].

Some studies have demonstrated the effectiveness of the brief counseling strategy for the practice of physical activity when compared to supervised physical exercise, especially in relation to cost-utility[6,7]. Countries such as the UK, New Zealand and Australia have adopted brief counseling preference in PHC because of their effectiveness in increasing physical activity time, producing higher QALY gain and being more economical for the health sector[7].

The brief counseling seeks to encourage healthy behaviors such as smoking cessation, healthy eating and physical activity, through individual or group sessions, lasting from five to thirty minutes[8,9]. It is considered an educational strategy and foreseen by the Brazilian national health promotion policy[10]. However, it is still little used as a resource for the promotion of physical activity to Brazilian PHC users[11,12,13].

Until the date, there is no information on the cost per QALY obtained in relation to the short counseling strategies for the practice of physical activity, the supervised exercise programs and the evaluation strategy of Primary Health Care. In addition, access to health systems and consumption of services varies from place to place, and it is important to provide an economic evaluation that addresses the reality of each context, especially oriented towards health promotion strategies.

Therefore, the objective of this study was to compare the additional cost per QALY obtained from three different strategies to promote physical activity in the Primary Health Care Units and to verify the influence of these interventions on the percentage of physically active adults.

METHODOLOGY

Designing

This is a longitudinal and randomized, non-double-blind study conducted at BHU located in the southeast region of the city of Rio Claro-SP, Brazil. The municipality has 186,253 inhabitants, as well as 22 BHU and has a Human Development Index of 0,803. For this research, four BHU with Physical Education professionals, all linked to the Family Health Strategy Program and assisted by the Family Health Care Center, were selected for convenience.

This research was approved by the Committee of Ethics in Research with Human Beings of the Institute of Biosciences of UNESP-Rio Claro, with protocol number 1,548,264. After completing the study, the participants of the evaluation group were invited by telephone to participate in the Physical Exercise Program at their respective BHU.

Sample Recruitment

The guests for this research are users of the Unified Health System, adults and both sexes. Included in the study were individuals aged > 18 years and with an active record in the BHU for at least two years. For the exclusion criteria of the study it was considered: not to attend three pre-scheduled interviews and people with intellectual and physical disabilities.

For the contact face-to-face with the participants, the following steps were accomplished: a) authorization of the Municipal Health Department to carry out the research; b) authorization of the coordinators of the BHU to start the work; c) sorting of the active charts by the random function of the Excel® program and automatically randomized in the interventions: (1) Brief Counseling (BC), (2) Indication to practice Physical Exercise in the BHU (IPPE-BHU) and (3) Evaluation Group (EG); d) analysis of medical records for collection of BHU users' phones; e) Attempted telephone contact with the users in order to invite them to participate in the research and schedule a face-to-face interview at BHU.

Interventions

BC: users who participated in this group, whose objective was to encourage the practice of physical activity, attended the BHU every three months, totaling five different moments of counseling during a year. Each BC session lasted an average of 20 minutes, and was done individually by the researchers. Concepts were discussed about: 1. What is physical activity, its domains and benefits; 2. What is sedentary behavior, its harms and how to reduce it; 3. Importance of reaching recommendations in physical activity, learning to organize time and healthy eating; 4. What physical activity intensities and recommended physical capacities can provide the greatest health benefits; and, 5. Transposing barriers, establishing real goals for the practice of physical activity and places that develop free practices in the neighborhood[14]. This information was transmitted by the researchers through five illustrative folders.

IPPE-BHU: users were invited to participate in the Physical Exercise program, offered regularly at the BHU in Rio Claro. The classes were of a generalized nature and of mild to moderate intensity, occurring in two alternating days per week, lasting 60 minutes and always under the guidance of a physical education professional. The objective of this intervention, in addition to increasing the level of physical activity, is to develop general physical fitness such as strength, flexibility, agility, aerobic capacity and motor coordination exercises, as well as to promote quality of life for the participants[15].

EG: users were instructed to maintain their usual routines, and did not receive counseling for the practice of physical activity, being invited only to perform the evaluations.

Evaluation Tools

The evaluations were performed in the three groups (BC, IPPE-BHU and EG) at five times, every three months, totaling 1 year of the interventions, which began in January 2016.

Profile Quiz

Based on a questionnaire interview, the participant's profile on age, sex, work, diseases, smoking, use of alcoholic beverages, eating habits and stress level was collected.

Anthropometric and Body Composition Measurements

Height and body mass were measured using an anthropometric scale (FILIZOLA® brand, Brazil). From this information the Body Mass Index (BMI) was calculated. The following intervals were used to classify the individuals according to nutritional status: low weight (<18,5 kg/m²), normal weight (18,5-24,9 kg/m²), overweight (25-29,9 kg/m²) and obesity (≥30 kg/m²).

Quality Adjusted Life Years (QALY)

To obtain the QALY, the SF-36 questionnaire was used, translated and validated for Brazil by Ciconelli et al.[16]. The instrument is composed of eight domains that evaluate the quality of life. For the calculation of the QALY, six domains were considered, as follows: functional capacity, physical and psychological capacity, social domain, pain domain, mental domain and vitality domain.

Thus, from a database with the SF-36 scores, the algorithm produced by Cruz et al.[17] was applied to obtain the utility values, in which the authorization of the researchers was obtained from the website of the Institute of Health Technology Assessment (IATS).

The utility value is a quantification of the quality of life of the individual in a single value ranging from 0 to 1. The utility value 0 represents the worst health or death and the value 1 corresponds to perfect health/full quality, which is used as a measure of outcome in cost-utility analyzes[17].

The QALY was calculated by multiplying the utility value by the survival time in years. The survival measure of this study was considered from the ratio of the duration interval between one evaluation and another on the total duration of the study[18].

Costs of Interventions

The costs of the interventions were based on the expenses reimbursed by the Unified Health System, and were supported in three parameters, as follows: hour value of the physical education professional, local cost and class material

(folder for BC and ball for IPPE-BHU), except for the EG intervention that considered only the first two variables.

Calculation of Incremental cost-effectiveness ratio (ICER)

The calculation of the ICER allows to measure the effectiveness/cost-utility of different strategies, being associated the incremental cost by a unit of effect, in this case measured in QALY. For the calculation of the ICER, the equation proposed by Drummond et al.[19]:

Equation 1:

$$ICER = \frac{\text{new intervention cost - standard intervention cost}}{\text{QALY of the new intervention - QALY of the standard}}$$

Physical Activity Measurement and Sedentary Behavior

The International Physical Activity (PA) Questionnaire (IPAQ-long version) was used to verify the level of PA and the time of sedentary behavior regarding the last week. The time in minutes of weekly PA in the four domains was calculated from the equation[20]: PA = walk + bicycle + moderate PA + (2 x vigorous PA). After the calculation, individuals with values >150 min/week were considered to be physically active. For this research were considered the PA in the leisure, in the transport and total time (sum of the time of PA in the leisure, transport, work and home environment).

Statistical analysis

For the data of the present study we adopted the analysis of intention to treat and demonstrated with mean, standard deviation and percentage distribution by category of response. Tukey's post-hoc ANOVA was applied for comparison of averages between the groups on the variables age, schooling, BMI, sitting time and physical activity time.

Also, for the demographic and health variables, the observed frequencies were counted and the chi-square test was applied with the objective of identifying differences BC, IPPE-BHU and EG groups. To verify possible statistical differences between classifications (0 to 10 min/wk), (11 to 149 min/wk) and (>150 min/wk) and groups at different times (months) for physical activity at leisure, transport and total time the chi-square test also was used.

All analyzes were performed using the Statistical Package for the Social Sciences® (SPSS) version 21 (IBM), adopting $p < 0.05$.

RESULTS

A total of 75 users participated in the study, 68% women with a mean age of 50±14 years, average income of $ 432,84 and a BMI of 28,34±6.37 kg/m².

Table 1 shows the profile of the groups studied, according to age, schooling, BMI, sitting time and time of leisure, transport and total physical activity. No significant differences were found between the groups at the time of the intervention.

Table 1. ANOVA one-way and profile of Primary Health Care users at the initial time of the research (Rio Claro - SP, Brazil, n = 75)

Profile Mean±SD	BC (n=36)	IPPE-BHU (n=21)	EG (n=18)	p
Age (years)	50±14,82	51±8,74	50±19,76	0,98
Schooling (years)	5,5±2,80	5,3±3,18	4,7±3,43	0,66
BMI (kg/m²)	28,40±6,73	28,25±4,15	28,34±7,97	0,99
Sitting time (hours and min/day)	2h09±0,44	2h20±0,54	2h43±1,34	0,17
PA in Leisure (min/week)	95.81±190.80	68.19±106.67	55.83±172.48	0,69
PA in Transportation (min/week)	141.64±189.95	99.95±88.08	90,56±137,42	0,51
Total PA (min/week)	1064,30±974,14	946.80±825.06	806.67±844.22	0,61

Legend: BC - Brief Counseling; IPPE-BHU - Indication for the program of physical exercise in the basic health unit; EG - Evaluation group; BMI - Body Mass Index; PA - physical activity; min – minutes; SD - standard deviation; p <0.05

The results of Table 2 indicate that the participants in each group are predominantly female, with a high prevalence of chronic non-communicable diseases and moderate to high stress. For the variables evaluated, no significant differences were found between groups.

Table 2. Profile information of BHU users at the initial time of the research, and their results of the chi-square test (Rio Claro - SP, Brazil, n = 75)

Perfil (n) %	BC (n=36)	IPEF-USB (n=21)	EG (n=18)	p
Female	(24) 66,6	(14) 66,6	(13) 72,2	0,90
Male	(12) 33,4	(7) 33,4	(5) 27,8	
Paid work				
Yes	(19) 52,8	(10) 47,6	(9) 50,0	0,93
No	(17) 47,2	(11) 52,4	(9) 50,0	
People with CND				
Yes	(24) 66,7	(14) 66,7	(9) 50,0	0,44
No	(12) 33,3	(7) 33,3	(9) 50,0	
Smoking				
Yes	(4) 11,1	(7) 33,3	(3) 16,7	0,11
No	(32) 88,9	(14) 66,6	(15) 83,3	
Drink alcohol				
Yes	(6) 16.7	(4) 19.0	(2) 11.1	0,78
No	(30) 83.3	(17) 81.0	(16) 88.9	
High Fat Diet				
Yes	(9) 25,0	(8) 38,1	(6) 33,3	0,56
No	(27) 75,0	(13) 61,9	(12) 66,7	
Moderate to higt stress				
Yes	(24) 66,7	(13) 61,9	(8) 44,4	0,28
No	(12) 33,3	(8) 38,1	(10) 55,6	

Legend: BC - Brief Counseling; IPPE-BHU - Indication for the program of physical exercise in the basic health unit; EG - Evaluation group; CND - Chronic Noncommunicable Diseases; p <0,05

QALY

Mean values at the end of one year of intervention totaled for the EG strategy at 0,788, followed by the IPPE-BHU intervention with 0,791 and the BC adding 0,800 QALY.

Costs of Interventions

The EG strategy cost $15,32/person/year, the BC presented a value of $16,26/person/year and the IPPE-BHU strategy cost $25,44/person/year.

ICER

BC strategy was cheaper and obtained higher QALY when compared to other interventions. In terms of QALY gains, the largest difference was concentrated between intervention BC vs. intervention EG with a value of 0,012 QALY.

Table 3 presents the ICER, with the BC vs. EG presented lower ICER, in the amount of $78,33/QALY. Still, the ICER between BC vs. IPPE-BHU achieved savings of $-1.020,00/QALY.

Table 3 - Cost difference, difference between QALY and ICER between interventions (Rio Claro – SP, Brazil, n = 75)

Comparisons	Δ of Costs	Δ of QALY	ICER
BC vs. EG	$ 0,95	0,012	$ 78,33/QALY
IPPE-BHU vs. EG	$ 10,13	0,003	$ 3.373,33/QALY
BC vs. IPPE-BHU	$ -9,18	0,009	$ -1.020,00/QALY

Legend: QALY - years of life adjusted for quality; BC - Brief Counseling; IPPE-BHU - Indication for physical exercise in health units; EG - Evaluation group; Δ - delta to identify differences between costs and QALY

Physical activity

Figure 1 indicates the percentage of physically active users in leisure, transportation and total time (leisure, transportation, work and home environment).

In relation to the percentage of active participants in free time, there were no statistically significant differences intra groups and between groups (Image 1 - A). A statistically significant difference was found at month 12 between brief counseling (36,1%) and evaluation group (11,1%) for physical activity transport (Image 1 - B).

The brief counseling group (94,4%) presented higher values than the evaluation group (66,7%) at 9 and 12 months for total physical activity (Image 1 - C). From the 6th month to the 12th, the evaluation group had a decrease in the percentage of physical activity, while the brief counseling group remained until the 12th month.

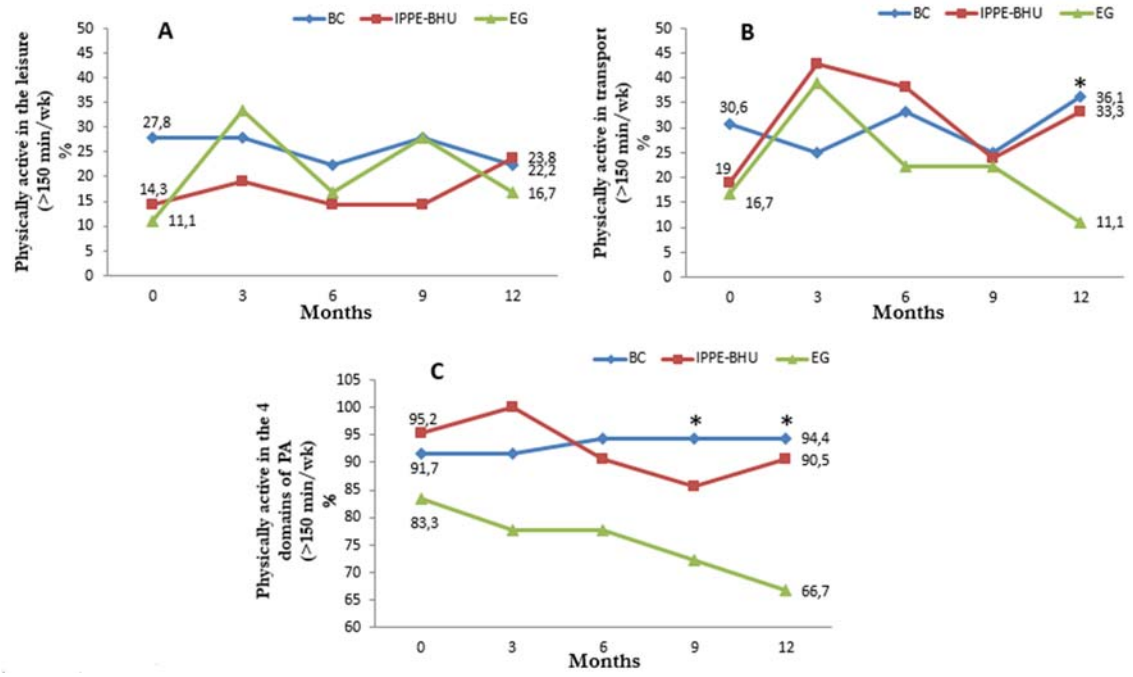

Figure 1. Chi-square test and percentage of physically active in leisure, transportation and total time (Rio Claro - SP, n = 75)
Legend: BC - Brief Counseling; IPPE-BHU - Indication for the program of physical exercise in basic health unit; EG - Evaluation group; * statistical significance for p <0.05

DISCUSSION

The results of the present study demonstrate that the BC strategy presented a lower cost per QALY gain when compared to the EG and the IPPE-BHU group. In addition, BC was more effective in increasing the number of physically active in the transportation domain and total time when compared to the other strategies, however, none of the strategies was able to increase the percentage of physically active in leisure.

The cost-utility results presented in this study are in line with the findings of the international scientific literature, where BC is more cost-effective than other interventions. According to the systematic review carried out Vijay et al. (2015)[7] the short interventions to promote physical activity are cost-utilitarian for PHC compared to usual care (condition of not receiving any intervention to promote physical activity), even with the large variation of costs per QALY gained among the countries analyzed, with values ranging from $75,49 to $18.544,25 thousand per QALY gain.

Still, Bailly et al. (2018)[21] compared a supervised physical exercise intervention with a progressively autonomous strategy, made up of verbal and written guidelines on physical activity for patients with cardiovascular diseases, so they found that both interventions were efficient in reducing medical care after a year; however, the progressively autonomous intervention was more efficient to improve the utilitarian values and the quality of life of the participants. Therefore, Isaacs et al. (2007)[22]

identified that the personalized counseling strategy with the use of materials was effective in increasing physical activity time and, in comparison with the supervised physical exercise strategy and for the group of supervised walks, it was also more economical.

Although the IPPE-BHU and EG interventions present utility values similar to BC, the difference favoring BC in this study is the lower cost per person for annual care, since the physical education professional's contact with the PHC user occurred in five times during the year, while the exercise program at BHU requires contact twice a week, increasing costs and not favoring cost-utility when compared to BC.

Regarding the variable physical activity, intervention studies performed in developed countries with the BC strategy and some performed in Brazil found positive results on quality of life, health markers (reduction of adiposity, systolic blood pressure, diastolic and total cholesterol) and, physical activity time or improvement over the percentage of physically active as in this study[23,24,25,26,27,28].

In this study, leisure physical activity did not present significant differences in the percentage of physically active participants, a fact that may be justified because all groups reached and surpassed physical activity recommendations (>150 min/week) in the total domain. According to the systematic review by Patnode et al. (2017)[25], the authors identified that studies that included participants with sub-optimal levels of physical activity at baseline (below 150 min/week) resulted in higher increases in physical activity compared to those who achieved the recommendation of physical activity, as in this study.

On the other hand, the majority of studies similar to ours are concentrated in developed countries and with samples containing a greater number of participants, collaborating with the power of the statistical tests adopted, however, the results identified a small percentage of physically active participants in leisure, relation to BC strategy compared to the condition of receiving no intervention to promote physical activity as identified in the studies of Anokye et al. (2014)[29], Leung et al. (2012)[30] and Over et al. (2012)[31].

Differently from the leisure domain, BC had higher levels of physical activity in the transport domain when compared to EG. This fact may be justified because the counseling encourages the practice of physical activity in transport, contributing to the individual's understanding that active locomotion is an important strategy to obtain health benefits. Associated with BC, the city of Rio Claro - SP has 32,79 km of cycle routes[32]. The sample of this study is low income and works outside the home. Such conditions can encourage active transportation[33] along with BC incentives.

A significant increase in the percentage of physical activity in total time (sum of the four physical activity domains) was also observed for the BC compared to the EG (without guidelines on physical activity) in the 9th and 12th months, there was maintenance for the BC and low for the EG from the 6th month, which indicates a positive influence of the educational contents of brief advice on its participants. In this way, affinity is generated by the study carried out by Fukuoka et al. (2019)[34]

recruited physically inactive women from the community, with an average of 52 years and compared different interventions, including the use of brief individual advice on physical activity for three months, with follow-up for the following 6 months using the accelerometer versus the control intervention, which did not receive guidance on physical activity. The study indicated an increase in the number of steps per day and per hour, the increase in moderate, vigorous, moderate to vigorous physical activity, assessed by accelerometer and self-reported physical activity in the last 7 days after the intervention. In this way, the results were maintained except for self-reported physical activity.

Therefore, associating the positive condition of physical activity with the lower cost per QALY gained, fosters the applicability of BC in Primary Health Care, especially within the Basic Health Units of the Brazilian Unified Health System.

CONCLUSION

The study concludes that the BC and the strategy of indicating the supervised physical exercise program are adequate strategies to maintain physical activity levels for one year; however, the BC presented the lowest cost per person, the best QALY/cost gain and the percentage of physical activity in the transport domain and the total time compared to EG (condition of not receiving guidance on physical activity), after a year of intervention. Therefore, a recommendation is made for the use of the BC strategy as an economically effective possibility for health promotion, and Primary Health Care requires a physical education professional, so it is suggested to indicate the practice of supervised physical exercise with the BC association.

Therefore, the results found in this study should be considered for decision-making by health managers regarding the incentive to promote physical activity in Primary Health Care.

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