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Assessment of a physical activity program on the medical-hospital costs of a healthcare company

Avaliação de um programa regular de atividade física sobre os custos médico-hospitalares de uma empresa de serviços de saúde

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ABSTRACT | Background: The protective effect of regular physical activity against risk of development of noncommunicable diseases and reduction of medical-hospital costs are well established in the literature. However, no study investigated the financial impact of workplace physical activity promotion programs in Brazil. **Objective:** To investigate the financial impact of a workplace physical activity promotion program on the medical-hospital costs of a private healthcare company. **Methods:** The average healthcare cost *per capita* was monitored along one year and compared between employees who performed physical activity with sufficient frequency and the ones who did not adhere to the program. Employees were matched per age, sex and length of work at the company. **Results:** From 3,744 employees offered participation in the program, only 80 performed physical activity 2 or more times per week. The average medical-hospital cost *per capita*/year was BRL 2,874.00 (SD=5.259), being BRL 125.00 higher, on average, for the employees who did not adhere to the program. The average medical-hospital cost *per capita*/year was BRL 1,901.00 lower, on average, for the employees who performed physical activity 3 or more times per week (n=3) compared to the ones who did not (p=0.34). **Conclusions:** The results of the present study do not allow asserting that the medical-hospital costs of employees who adhered to the program decreased. Longer follow-up and adjustments in the program design are needed to assess its actual impact.

Keywords | health promotion; health care costs; working environment; noncommunicable diseases.

RESUMO | Introdução: O efeito protetor da prática regular de atividade física na redução do risco de doenças crônicas não transmissíveis e dos custos médico-hospitalares é bem estabelecido na literatura. No entanto, o Brasil carece de estudos que avaliem os impactos financeiros de programas que incentivem a prática de atividade física no trabalho. **Objetivos:** Avaliar o impacto financeiro de um programa de incentivo à prática regular de atividade física sobre os custos médico-hospitalares de uma empresa privada de serviços de saúde. **Métodos:** Os custos médios *per capita* com o plano de saúde da empresa foram acompanhados por um ano e comparados no que diz respeito aos trabalhadores que praticaram atividade física com frequência suficiente e os que não aderiram ao programa. Os pares de comparação foram homogeneizados de acordo com a idade, o sexo e o tempo de empresa. **Resultados:** Dos 3.744 trabalhadores com acesso ao programa, apenas 80 praticaram atividade física 2 vezes por semana ou mais. O custo médio *per capita* foi R$ 2.874 (DP=5.259) em 1 ano, R$ 125,00 a mais do que para os que não praticaram (p=0,88). Aqueles que praticaram atividade física 3 vezes ou mais por semana (n=32) apresentaram custo médio *per capita* de R$ 3.635 (DP=6.994) em 1 ano, R$ 1.901 a menos do que os pares que não praticaram (p=0,34). **Conclusões:** O estudo não permite afirmar que houve redução dos custos médico-hospitalares dos participantes do programa. Maior tempo de seguimento e ajustes no desenho do projeto são necessários para avaliar seu impacto.

Palavras-chave | promoção da saúde; custos de cuidados de saúde; ambiente de trabalho; doenças crônicas não transmissíveis.

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INTRODUCTION

Noncommunicable diseases (NCDs) pose one of the main public health problems in the present time. According to World Health Organization (WHO) estimates, NCDs accounted for about 40 million deaths, almost 70% of the global mortality, in 2015. The main causes of death by NCDs were cardiovascular diseases (45%), cancer (22%), chronic respiratory illnesses (10%) and diabetes (4%)[1].

The statistical data for Brazil follow the same trend. In 2013, NCDs accounted for about 72% of the total number of deaths in the country. According to National Health Survey (Pesquisa Nacional de Saúde–PNS) estimates, 45.1% of the interviewees reported to have at least one NCD, the prevalence being higher among females (50.4%) compared to males (39.2%)[2]. Within this context, the Ministry of Health formulated a Plan of Strategic Actions against NCDs in Brazil for 2011–2020[3].

Physical inactivity is one of the main risk factors for NCD-related mortality[4]. Adults who do not perform at least 150 minutes of moderate-intensity physical activity per week exhibit higher risk of death compared to the ones rated active[5]. According to estimates, the sedentary lifestyle accounts for 3.2 million deaths worldwide[4]. One study found that 15% of hospital admissions within the Unified Health System (Sistema Único de Saúde–SUS) in 2003 were associated with physical inactivity, having a financial cost of BRL 275.6 millions[6].

Its risk for health notwithstanding, the sedentary lifestyle rate continues increasing. According to WHO, 23% of adults above 18 years old worldwide did not regularly perform physical activity in 2010[5]. In Brazil, 45.1% of the population is considered to be physically inactive, despite an increase of 1.17% in the frequency of leisure-time physical activity detected the by Surveillance of Risk and Protection Factors for Chronic Diseases via Telephone Survey (VIGITEL) 2016[7]. Among individuals with private health insurance, the frequency of physical inactivity decreased from 19.2 to 14.2% from 2008 to 2016[8]. The prevalence of sedentary lifestyle among Brazilian workers seems to correspond to the national average. A study conducted with 6,398 workers found that 42% of the participants had a sedentary lifestyle[9].

Regular physical activity is a well-known protective factor, being associated with reduced risk of ischemic heart disease, stroke, diabetes and breast and colon cancer[5]. For this reason, actions and programs for promotion of regular physical activity are encouraged whenever possible. The Brazilian National Policy of Health Promotion considers physical activity incentives as a high-priority subject[10]. In turn, WHO recommends employers to provide opportunities for workers to increase their levels of physical activity either at the workplace or by means of other incentives[5].

In addition to the acknowledged benefits for health and incentives by national and international governmental and non-governmental organizations, employers have further reasons to implement programs of promotion of regular physical activity. To reduce the cost of private health insurance provided to employees — which currently represents the second highest source of benefit costs after payroll only — employers are increasingly investing in workplace health promotion programs[11].

A study conducted in 2012 found that all 194 interviewed employers provided private health insurance to their employees as benefit; 31% adopted a prepaid system, 63% a postpaid, and 6% a hybrid system[12]. In prepaid systems, the risk is assumed by employers, as they pay for all medical-hospital care and an additional management fee. In postpaid systems, the risk is assumed by health insurance companies; employers pay a premium which value is calculated based on actuarial criteria and is meant to cover any cost along the period defined in the contract[13]. Management of events via appropriate use of health insurance plans is one of the main challenges for employers which pay for either prepaid or postpaid health insurance[12].

The cost of health insurance plans continuously increases, while the variation of medical-hospital costs (VMHC) is systematically higher than the one of the overall inflation rate. VMCH was 20.4% in 2016, while the Broad Consumer Price Index (Índice de Preços ao Consumidor Amplo–IPCA) was 6.3%[14]. For this reason, workplace health promotion programs (WWPH), including incentives for physical activity, are of particular interest for employers. Reasons are not only the benefits of such programs for health, but also their potential to reduce the cost of medical-hospital care, particularly within postpaid systems (as a function of their operating costs)[13].

The aim of the present study was to investigate the financial impact of a regular physical activity incentive

program on the medical-hospital costs of a private healthcare company.

METHODS

The present study investigated and described the results of a regular physical activity incentive program developed at a private healthcare company as a part of a benefit package offered to its employees and sponsored by the employer. Incentives increased progressively as a function of the employees' length of work at the company and program attendance frequency. At the time of the beginning of the study, there were 8,852 employees at the company distributed all across Brazil. The employees and their families were provided postpaid, cost-sharing private health insurance. As a function of the heterogeneous profile of the employees' use of the insurance plan, we included only the ones in the São Paulo Area having worked more than 6 months for the employer (n=3,744) and excluded also their families. Follow-up lasted 12 months (October 2016 through September 2017).

The regular physical activity incentive program was offered by the employer to all the employees through internal communication media, such as intranet and bulletin boards. No eligibility criteria were established and adherence was voluntary. The employees could choose among four plans with different cost-sharing charges. Actual participation in the program was measured from monthly reports provided by the supplier, in turn based on the frequency of user password records for access to the various health clubs within the accredited network.

The variables of interest analyzed along the study period were: adherence to program, sufficient frequency and average medical-hospital cost *per capita*/year. Adherence was defined as participation in program at least once in 12 months. Sufficient frequency was defined as per the WHO criteria, which recommends the equivalent of at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity per week[5]. Each user password record was computed as 50-minute stay at the health club. We analyzed the data corresponding to employees who participated in the program at least 96 times (2 or more times per week, on average) or 144 times (3 or more times per week, on average) in the year. The average medical-hospital cost *per capita* was analyzed based on the monthly reports the insurance company provides the employer, which include fees of consultations, diagnostic tests, hospital admissions, therapeutic procedures and emergency care, among others. To control for possible distortions, we excluded participants who generated costs above the mean cost *per capita*/year plus 3 standard deviations, which corresponded to BRL 42,000.00.

The data were compiled using software Microsoft Excel® 2016 and analyzed with Minitab 17.3.1 2013, 2016, Minitab Inc. USA. To ensure homogeneity in the comparison of the average cost *per capita*/year between participants with sufficient physical activity and the ones who did not adhere to program, employees were matched per age, sex and length of work at the company. The average cost *per capita*/year was compared between participants who performed physical activity 96 or more in the year (Group A) and matched employees who did not adhere to the program (Group B). Subgroup analysis was performed comparing participants who performed physical activity 114 or more times in the year (Group C) and matched employees who did not adhere to the program (Group D). *Student's* t-test was used to compare means between independent populations, and the chi-square test to investigate associations between categorical variables. Multivariate analysis of variance (MANOVA) was performed to investigate associations between quantitative variables in the groups defined as per the qualitative variables. Correlation analysis was performed between program attendance frequency and medical-hospital costs.

The participants' names were encoded to ensure the confidentiality of the data. The study was approved by the research ethics committee of State University of Campinas (UNICAMP), ruling no. 2,033,877.

RESULTS

From 5,616 employees allocated to the São Paulo Area, 3,744 met the inclusion criteria. Following divulgation through internal media, 630 employees (16.8%) adhered to the program, i.e., participated at least once the program along the analyzed period. The employees

who performed physical activity 96 or more (n=80) or 144 or more (n=32) times in the year represented 2.1% and 0.8% of the total number of individuals included in the study (n=3,744), respectively. The characteristics of the employees included in the study were not homogeneous. Association was found between variables "sex" and "physical activity frequency" 96 times or more along the analyzed period. The rate of adherence was 3.98% among the men and 2.14% among the women (p<0.05). On these grounds, the participants were matched for comparison of the average medical-hospital costs. The remainder of the analyses performed are described in Table 1.

Matching resulted in homogeneous groups. Age, length of work at the company and medical-hospital costs did not exhibit association with variable "sex" (p=0.801; p=0.819; p=0.884) or "physical activity frequency" 96 times or more along 12 months (p=1; p=0.715; p=0.884). The remainder of the results are described in Table 2.

The average cost *per capita*/year was compared between groups A versus B and C versus D. Along the analyzed period, the average cost *per capita*/year was BRL 125.00 higher in Group A compared to Group B (p=0.884) and BRL 1,901.00 lower in Group C compared to Group D (p=0.34) as shown in Table 3. These differences were not statistically significant.

Correlation analysis did not evidence any trend in the relationship between program attendance frequency and medical-hospital costs (p=0.189).

DISCUSSION

The impact of NCDs on the global population, especially as concerns modifiable risk factors, such as physical inactivity, evidences the relevance of health and quality of life promotion programs also at the workplace. In addition to improving the health of workers, workplace health promotion seems to have a relationship with increase of productivity, reduction of medical-hospital costs and talent retention[15]. Studies on medical-hospital costs conducted in the United States point to a reduction in the use of healthcare services following implementation of WHPPs. Some such studies further evidenced positive return on investment (ROI) when factors related to productivity, such as absenteeism, are included in calculations[16].

However, to yield positive financial outcomes, WHPPs depend on several factors. A meta-analysis performed by

Table 1. Subjects' characteristics before matching according to sex and adherence to the physical activity program, São Paulo, 2016-2017 (n=3,744).

Characteristics	n	Mean±SD	p value
Age			
Female	3,011	35.7±8.7	0.422
Male	733	36±9.1	
Length of work at company (months)			
Female	3,011	91.81±73.95	0.857
Male	733	91.26±74.62	
Medical-hospital costs (BRL/year)			
Female	3,011	3.611±5.687	<0.001
Male	733	2.267±4.966	
Frequency of program attendance along 12 months			
Total (n=3,744)			
Female	3,011	6.4±23.1	<0.05
Male	733	9.2±28.2	
≥1 (n=630)			
Female	499	38.8±44.3	<0.05
Male	131	51.2±48.2	
≥96 (n=80)			
Female	55	140.6±35.9	0.259
Male	25	131.8±30	
≥144 (n=32)			
Female	24	173.7±26.6	0.594
Male	8	170±11.6	
≥144 (n=32)			
With medical-hospital costs	29	174.1±24.4	0.051
Without medical-hospital costs	3	160±7.21	

SD: standard deviation.

Chapman in 2012 assessed the financial outcomes of 62 WHPPs. Thirty-two of the included studies exclusively used medical-hospital costs as outcome measure, and found 24.5% reduction of such costs. According to the study findings, the factors associated with positive financial outcomes included adherence of a large number of participants, longer duration and focus on obtainment of the expected results. On these grounds, the cost benefit-ratio was 1:6.1[17].

Planning is a critical factor for the success of WHPPs. For this purpose, Pronk suggested the 4-Ss method (size, scope, scalability and sustainability), i.e., the extent of the program should meet the actual needs; its scope should be aligned to the organization goals; implementation should follow a graded series of steps to achieve the intended results; and resources and support should be adequate to ensure the maintenance of the program along the period required to achieve its goals. Pronk further suggested a model for program assessment named PIPE Impact Metric (penetration, implementation, participation and effectiveness). Penetration refers to the proportion of the target population that is reached through divulgation of the program or intervention. Implementation reflects the degree in which the program complied with the design specifications and associated work plans. Participation refers to the proportion of invited individuals who enroll in the program according to the program protocol. Effectiveness refers to the rate of successful goals, i.e., how many participants succeeded in achieving the goal established in the project design[18].

In the present study, we were not able to establish whether planning complied with the 4-Ss model. For this reason, we could not assess whether implementation fitted with the program design as recommended in the PIPE model. We rated penetration as satisfactory, since all the employees received information about the launching of the program through internal communication media. However, facing the low adherence rate (16.9%, 631 employees) it is safe to assume that the strategies for engagement employed were not effective. Participation, measured as sufficient physical activity frequency, was considered unsatisfactory, since its rate was just 2.1% (80 participants). The program effectiveness, measured as reduction of the average medical-hospital costs *per capita*/year, was impaired by the low participation rate. As a result, we cannot draw any conclusion on whether the program had actual financial impact or not. We could neither calculate the ROI, although it is a subject of discussion and research in many international studies[17].

The present study has significant limitations which need to be considered in the redesigning of the regular

Table 2. Characteristics of groups A versus B and C versus D per age, sex and length of work at company, São Paulo, 2016–2017 (n=3,744).

n	Group A	Group B	p value	Group C	Group D	p value
	80	80		32	32	
Age (mean±SD)	35.6±7.5	35.6±7.5	1	35.7±7.6	35.7±7.6	1
Females (%)	69	69	1	75	75	1
Males (%)	31	31		25	25	
Length of work at company (months) (mean±SD)	88.8±71.3	93.0±74.4	0.714	93.2±72.1	92.1±64.1	0.946

Table 3. Average cost per capita/year of groups A versus B and C versus D along 12 months (Oct 2016 to Sept 2017), São Paulo (n=3,744).

n	Group A	Group B	p value	Group C	Group D	p value
	80	80		32	32	
Cost *per capita*/year (BRL) (mean±SD)	2.874±5.259	2.749±5.553	0,884	3.635±6.994	5.536±8.731	0,340

physical activity incentive program. In addition, they are also relevant for future follow-up of data to yield information useful for the organization, healthcare professionals who recommend this type of intervention, and employers who fund or sponsor WHPPs. The number of employees who performed physical activity and its frequency were not known at the onset of the study; therefore, we cannot assert that the program effectively led sedentary individuals to start exercising. Neither can we rule out the possibility that participants with a previous healthy lifestyle adhered to the program as a function of the financial aid provided by the employer. Similarly, the status of physical activity among the employees who did not adhere to the program was not assessed by the company managers, resulting in confounding bias in the analysis of the data.

The average age of the employees (35.6±7.5 years old) is within an age range considered of low risk for NCDs and less frequent use of healthcare services. For this reason, measurement of the average medical-hospital costs *per capita*/year might not be the best approach to establish the financial impact of a program of incentive of regular physical activity at the workplace as concerns this population. Future studies might include other variables, for instance, assessment of the program impact on presenteeism and absenteeism. Also, some indirect aspects might be considered for individuals within this age range, particularly the ones related with musculoskeletal disorders, which are common among healthcare workers. Several studies showed that workplace physical activity programs contribute to reduce the number of occurrences and intensity of perceived musculoskeletal pain[19,20].

As the sensitivity of statistical tests is strongly associated with the sample size, the number of participants needs to significantly increase for the impacts of programs to be more accurately assessed and achieve statistical significance. The motivation strategies to enhance adherence to the analyzed program might be reworked via a graded series of steps, including reinforcement of communication through integrated media and different approaches preferentially customized and targeting the workers at higher risk.

Implantation of WHPPs is advocated by national and international, governmental and non-governmental organizations mainly as a function of their well-established effects on health and their ability to induce changes in behavior and risk factors. The current scientific literature includes countless evidence of such effects, including financial impacts. However, the latter largely depend on the design and adequate implantation of WHPPs. In a recent systematic review, O'Donnell found that 46 out of 47 analyzed programs saved money and 41 saved money in excess of the program costs. ROI varied as a function of the methods employed in the analyzed studies, sample size, scope and quality of programs, among other factors. The mean ROI of the 10 high-quality studies was 2.28[21].

To summarize, the present study provides evidence on the relevance of better planning of WHPPs, including clear goals, performance indicators, identification of the best strategies to achieve and maintain satisfactory participation, and scope appropriate to the employees' profile and the organization's needs. Longer follow-up, ideally of 3 to 5 years, is required to achieve and duly assess the intended results.

CONCLUSION

Physical inactivity contributes to the high prevalence of NCDs among the global population. Implantation of physical activity incentive programs is one of the initiatives developed by employers within the context of workplace health promotion and might reduce medical-hospital costs. In the present study, we were not able to draw any conclusion on the program effectiveness to reduce the cost of health insurance for the employer due to the following reasons: lack of information on previous performance of physical activity by the analyzed population, resulting in confounding bias, and the fact that the average age of the program participants was not representative of the population at higher risk of NCD. An additional source of bias was the impossibility to gather data on NCD-specific costs, as the average medical-hospital costs *per capita* probably also included expenses unrelated to NCDs.

Longer follow-up and adjustments in the design of programs are needed to assess their actual impacts.

REFERENCES

1. World Health Organization. World health statistics 2017: monitoring health for the SDGs, sustainable development goals. Geneva: World Health Organization; 2017.
2. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância de Doenças e Agravos não Transmissíveis e Promoção da Saúde. Saúde Brasil 2014: uma análise da situação de saúde e das causas externas. Brasília: Ministério da Saúde; 2015. 463p.
3. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Análise de Situação de Saúde. Plano de ações estratégicas para o enfrentamento das doenças crônicas não transmissíveis (DCNT) no Brasil 2011-2022. Brasília: Ministério da Saúde; 2011. 148p.
4. World Health Organization. Global status report on noncommunicable diseases 2014. Geneva: World Health Organization; 2014.
5. World Health Organization. Global Recommendations on Physical Activity for Health. Geneva: World Health Organization; 2010.
6. Bielemann R, Silva B, Coll C de V, Xavier MO, Silva SG. Burden of physical inactivity and hospitalization costs due to chronic diseases. Rev Saúde Pública. 2015;49:1-8. https://doi.org/10.1590/S0034-8910.2015049005650
7. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância de Doenças e Agravos não Transmissíveis e Promoção de Saúde. Vigitel Brasil 2016: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico. Brasília: Ministério da Saúde; 2017. 162p.
8. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância de Doenças e Agravos não Transmissíveis e Promoção de Saúde. Vigitel Brasil 2016: Saúde Suplementar: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico. Brasília: Ministério da Saúde; 2017. 159p.
9. Hyeda A, Costa ÉSM, Sbardellotto F, Ferreira JCC. A aplicação da arquitetura de informação na gestão dos riscos das doenças crônicas em trabalhadores: uma análise preliminar. Rev Bras Med Trab. 2016;14(1):29-36.
10. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância de Doenças e Agravos Não Transmissíveis e Promoção da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Política Nacional de Promoção da Saúde. Brasília: Ministério da Saúde; 2015. 37p.
11. Aldana S, Merrill R, Price K, Hardy A, Hager R. Financial impact of a comprehensive multisite workplace health promotion program. Prev Med. 2005;40(2):131-7. https://doi.org/10.1016/j.ypmed.2004.05.008
12. Willis Towers Watson. Planos de Benefícios no Brasil [Internet]. 2014 [cited on 26 Jan 2018]. Available at: https://www.towerswatson.com/pt-BR/Insights/IC-Types/Survey-Research-Results/2014/05/pesquisa-sobre-planos-de-beneficios-no-brasil
13. Sakamoto LM. O modelo de pós-pagamento nos contratos de plano de saúde e a viabilização do direito de extensão do benefício pós-emprego [MA dissertation]. São Paulo: Universidade de São Paulo; 2016.
14. Instituto de Estudos de Saúde Suplementar. Variação de Custos Médico-Hospitalares [Internet]. São Paulo: IESS, 2017 [cited 5 Dec 2017]. Available at: https://www.iess.org.br/cms/rep/VCMH_set17.pdf
15. Aldana S. Financial impact of health promotion programs: a comprehensive review of the literature. Am J Health Promot. 2001;15(5):296-320. https://doi.org/10.4278/0890-1171-15.5.296
16. Grossmeier J, Terry P, Anderson D, Wright S. Financial Impact of Population Health Management Programs: Reevaluating the Literature. Popul Health Manag. 2012;15(3):129-34. https://doi.org/10.1089/pop.2010.0086
17. Chapman L. Meta-Evaluation of Worksite Health Promotion Economic Return Studies: 2012 Update. Am J Health Promot. 2012;26(4):TAHP1-12. https://doi.org/10.4278/ajhp.26.4.tahp
18. Pronk N. Designing and Evaluating Health Promotion Programs. Dis Manage Health Outcomes. 2003;11(3):149-57. https://doi.org/10.2165/00115677-200311030-00002
19. Lima VA, Aquilas AL, Ferreira Junior M. Efeitos de um programa de exercícios físicos no local de trabalho sobre a percepção de dor musculoesquelética em trabalhadores de escritório. Rev Bras Med Trab. 2009;7(1):11-7.
20. Corrêa L, Rombaldi A, Silva M. Physical activity level and self-reported musculoskeletal pain perception among older males. Rev Dor. 2016;17(3):183-7. http://dx.doi.org/10.5935/1806-0013.20160067
21. O'Donnell M. What is the ROI for Workplace Health Promotion? It Really Does Depend, and That's the Point. Am J Health Promot. 2015;29(3):v-viii. https://doi.org/10.4278/ajhp.29.3.v

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