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Active and healthy lifestyle in Brazilian Primary Health Care user's: A pragmatic clinical trial about "VAMOS" behavior change program

Estilo de vida ativo e saudável em usuários brasileiros da Atenção Primária à Saúde: Um ensaio clínico pragmático sobre o programa de mudança de comportamento "VAMOS"

Estilo de vida activo y saludable en usuarios brasileños de Atención Primaria de Salud: Un ensayo clínico pragmático sobre el programa de cambio de comportamiento "VAMOS"

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Abstract
This study aimed to investigate the effectiveness and maintenance of the behavior change program "VAMOS", version 2.0, on behavioral and health outcomes in Brazilian users (≥ 18 years) of Primary Health Care (PHC) in Florianópolis, state of Santa Catarina, southern Brazil. A pragmatic clinical trial was carried out between 2016 and 2019 in Basic Health Units, with 265 users allocated in the intervention group (n = 125) and the control group (n = 140). The intervention group participated for three months in the VAMOS to promote physical activity (PA) and a healthy diet. The control group received in a single meeting counseling about the importance of an active and healthy lifestyle. Variables of PA (daily minutes in light PA, moderate-to-vigorous PA, total PA, and sedentary behavior), eating behavior (weekly consumption of fruits, vegetables, and soda drinks), anthropometry (body mass, waist circumference (WC), and body mass index), and quality of life (QOL) (positive or negative perception), were evaluated, through interviews and objective measures, in the pre-intervention, post-intervention, and 12 months after the end of the intervention. The intervention group increased moderate-to-vigorous PA bouts, consumed of vegetables and, QOL, and decreased the consumption of soda drinks and WC ($p<0.05$). The intervention was sufficient to maintain the achieved benefits of moderate-to-vigorous PA bouts, soda drink consumption, and WC. VAMOS effectively promote an active and healthy lifestyle in PHC users and, its strategies proved to be adequate to maintain the gains acquired. VAMOS is a pioneer and a health innovation.
Keywords: Public health; Health promotion; Lifestyle; Motor activity; Diet healthy.

Resumo
Este estudo teve como objetivo investigar a efetividade e manutenção do programa de mudança de comportamento "VAMOS", versão 2.0, sobre desfechos comportamentais e de saúde, em usuários brasileiros (≥ 18 anos) da Atenção Primária à Saúde (APS) de Florianópolis, estado de Santa Catarina, sul do Brasil. Foi realizado um ensaio clínico pragmático, entre 2016 e 2019, em Unidades Básicas de Saúde com 265 usuários alocados no grupo intervenção (n =

125) e no grupo controle (n = 140). O grupo intervenção participou durante três meses do VAMOS, direcionado à promoção da atividade física (AF) e alimentação saudável. O grupo controle recebeu, em um único momento, aconselhamento sobre a importância de um estilo de vida ativo e saudável. Variáveis de AF (minutos diários em AF leve, AF moderada e vigorosa, AF total e comportamento sedentário), comportamento alimentar (consumo semanal de frutas, verduras e legumes e, refrigerantes), antropometria (massa corporal, circunferência da cintura (CC) e índice de massa corporal) e qualidade de vida (QV) (percepção positiva ou negativa) foram avaliadas, por meio de entrevista e medidas objetivas, na pré-intervenção, pós-intervenção e 12 meses após o término da intervenção. O grupo intervenção aumentou os *bouts* em AF moderada e vigorosa, o consumo de verduras e legumes e a QV e, diminuiu o consumo de refrigerantes e a CC. A intervenção foi suficiente para manter os benefícios em relação aos *bouts* em AF moderada e vigorosa, consumo de refrigerantes e CC ($p<0,05$). O VAMOS foi efetivo na promoção de um estilo de vida ativo e saudável em usuários da APS e suas estratégias se mostraram adequadas para a manutenção dos ganhos adquiridos. O VAMOS é pioneiro e constitui uma inovação em saúde.
Palavras-chave: Saúde pública; Promoção da saúde; Estilo de vida; Atividade motora; Dieta saudável.

Resumen
Este estudio tuvo como objetivo investigar la efectividad y el mantenimiento del programa de cambio de comportamiento "VAMOS", versión 2.0, sobre los resultados conductuales y de salud en usuarios brasileños (≥ 18 años) de Atención Primaria de Salud (APS) en Florianópolis, estado de Santa Catarina, sur Brasil. Se realizó un ensayo clínico pragmático entre 2016 y 2019 en Unidades Básicas de Salud con 265 usuarios asignados en el grupo de intervención (n = 125) y en el grupo de control (n = 140). El grupo de intervención participó durante tres meses en VAMOS con el objetivo de promover la actividad física (AF) y la alimentación saludable. El grupo de control recibió, en un único encuentro, asesoramiento sobre la importancia de un estilo de vida activo y saludable. Se evaluaron las variables de AF (minutos diarios en AF leve, AF moderada y vigorosa, AF total y comportamiento sedentario), conducta alimentaria (consumo semanal de frutas, verduras y refrescos), antropometría (masa corporal, circunferencia de la cintura (CC) e índice de masa corporal) y calidad de vida (CV) (percepción positiva o negativa), a través de entrevistas y medidas objetivas, en el preintervención, posintervención y 12 meses después del final de la intervención. El grupo de intervención aumentó los episodios de AF moderada y vigorosa, el consumo de verduras y la CV, y disminuyó el consumo de refrescos y la CC. La intervención fue suficiente para mantener los beneficios logrados con relación a los episodios de AF moderada y vigorosa, consumo de refrescos y CC ($p<0,05$). VAMOS fue eficaz en la promoción de un estilo de vida activo y saludable en los usuarios de APS y sus estrategias demostraron ser adecuadas para mantener los beneficios adquiridos. VAMOS es pionero e innovador en salud.
Palabras clave: Salud pública; Promoción de la salud; Estilo de vida; Actividad motora; Dieta saludable.

1. Introduction

The lifestyle of the world population has changed in recent decades - influenced by demographic, epidemiological, nutritional, and technological transitions, leading to an increase in non-communicable chronic diseases (Thompson & Kent, 2017; Saldiva, 2018). Physical activity and healthy eating are critical factors in preventing these diseases. However, in Brazil, the prevalence of physical inactivity and insufficient consumption of fruits and vegetables is high among adults and older adults, representing 44.8% and 65.7%, respectively (Brazil, 2020). Thereby, the guidelines for health care at the level of Primary Health Care (PHC) of the national health system have been proposing interventions aimed at promoting physical activity (PA) and healthy diet for the population (Becker et al., 2014; Brazil, 2021a; Ramos et al., 2014; Sá et al., 2016).

However, the magnitude of non-communicable chronic diseases, associated with low adherence to physical activity and healthy eating by the population, calls on managers and health professionals to reflect on their practices, directing them towards an approach aimed at improving health conditions (Benedetti et al., 2012; Marques et al., 2020). Faced with this scenario and to promote health sustainably, the PHC intervention proposals started to adopt health education to guide people to adopt and maintain an active and healthy lifestyle (Benedetti et al., 2019; Benedetti et al., 2020).

Behavioral interventions developed in public health contribute of physical activity and healthy eating (Benedetti et al., 2012; Benedetti et al., 2020; Carvalho et al., 2020; Carvalho et al., 2021; Tomicki et al., 2021). Systematic reviews evidence the effectiveness of behavioral interventions developed in public health aimed at specific health outcomes, including obesity control (Menezes et al., 2020), promotion of healthy eating, and physical activity (Menezes et al., 2016). These interventions can serve as examples of new ways to approach health.

A strategy developed specifically for this purpose is the behavior change program "Active Life Improving Health" (VAMOS), version 2.0 (Benedetti et al., 2017; Tomicki et al., 2021). He has proven its effectiveness in different contexts (Gerage et al., 2017; Gerage et al., 2020; Meurer et al., 2019; Quadros et al., 2020; Souza et al., 2020). However, no studies are carried out in PHC settings, specifically in Primary Care Units (known in Brazil as UBS). Therefore, it is essential to confirm that interventions are effective in real routine conditions, and not just in studies carried out under ideal conditions (Mendonça & Lopes, 2012). Thus, our study aimed to investigate the effectiveness and maintenance of the VAMOS, version 2.0, on behavioral and health outcomes in UBS users.

2. Methodology

2.1 Design

A pragmatic, parallel-controlled, non-randomized, non-blinded, community-based clinical trial with observational follow-up. The VAMOS was implemented between 2016-2019 in five UBS located in Florianópolis, the capital of the state of Santa Catarina, southern Brazil.

2.2 Ethical procedures

The study was approved by the Human Research Ethics Committee of the Federal University of Santa Catarina (No 1,394,492) and all eligible participants agreed and signed an informed consent document. The study was registered at ClinicalTrials.gov - NCT02823301.

2.3 Study participants

User's ≥ 18 years of age, resident in Florianópolis, sedentary or insufficiently active. Users active physically and/or users who were interested in receiving nutritional guidelines were excluded.

2.4 Recruitment of participants

Recruitment took place over a period of 30 days at each UBS. Health professionals invited the UBS users to participate in the VAMOS. Recruitment strategies have been described elsewhere (Tomicki et al., 2021). It should be noted that in each UBS the period of disclosure and screening occurs at different times.

2.5 Screening

The screening was carried out through a face-to-face and individual interview conducted by previously trained researchers, not blinded. To check the inclusion criteria related to the practice of physical activity (PA), the questions in the leisure section of the International PA Questionnaire (IPAQ) were used (Matsudo et al., 2001). Users who did not perform PA during the week were classified as "sedentary" and users who did less than 150 minutes of moderate-intensity PA or less than 75 minutes of vigorous PA per week were classified as "insufficiently active". Users who met the eligibility criteria were invited to participate in the VAMOS.

2.6 VAMOS Program - intervention group

The intervention group (IG) participated, for three months, in the VAMOS, version 2.0, that aim to encourage behavior changes associated with an active and healthy lifestyle (PA and eating). UBS offered the intervention, one group per location, one meeting per week lasting 90-120 minutes each. Professionals of physical education conducted the meetings at UBS,

previously certified in online training (José et al., 2019). The meetings were held in the form of "conversation circles". The participants received the printed educational material from the intervention, which included 12 notebooks with different themes related to each program's meetings. When it was impossible to be present at any meeting, it was suggested that the intervention leader replace the meeting. Details about the VAMOS, version 2.0, can be found in a previous study (Benedetti et al., 2017; Tomicki et al., 2021) and on the program's website: https://vamos.ufsc.br/.

2.7 Control group

After creating the IG and the beginning of the VAMOS in each UBS, a control group (CG) was also created in each UBS. The CG created, the participants were paired by sex and age, aiming at obtaining a profile like that of the IG participants. Recruitment was carried out by professionals from the health teams of each UBS, considering the same inclusion criteria as the IG. After that, the users indicated by the professionals were contacted and after confirmation of eligibility by previously trained researchers, they were included in the group. CG participants just received counseling on the importance of an active and healthy lifestyle through PA and a healthy diet. This information was passed, face-to-face and individual, on before the baseline collects by previously trained researchers, not blinded.

2.8 Outcome variables and data collection

Effectiveness and maintenance were assessed based on the RE-AIM framework (Almeida et al., 2013). VAMOS markers were evaluated: primary - PA and eating behavior (EB) and secondary - anthropometry and quality of life (QOL). Participants from both groups (IG and CG) were equally assessed. Data collection was carried out in three moments: pre-intervention (baseline), post-intervention (after the three months of intervention), and maintenance (12 months after the end of the intervention). The collections were carried out by previously trained researchers, not blinded. The description of the collected data follows.

Demographic data. An individual face-to-face interview was conducted to identify the participants' general characteristics, with data on sex, age group, race, marital status, educational level, professional occupation, average monthly family income, morbidity, and nutritional status.

PA. Was assessed objectively with the use of accelerometers (ActiGraph, GT3X, and GT3X +). For analysis purposes, valid data were considered a minimum of 10 hours of daily activity recordings for at least four days - three weekdays and one weekend day (Chen et al., 2009). Data were collected at the frequency of 30 Hz and analyzed in 60-second epochs. Periods with consecutive zeroes for 60 minutes or more (with 2 minutes of tolerance) were interpreted as non-wear time and excluded from the analysis (Choi et al., 2011). The time spent on light PA (LPA = 100 - 2689 counts min-1), and moderate and vigorous PA (MVPA ≥ 2690 counts min-1) (Sasaki et al., 2011) was used for analysis. The variable total PA was created by adding the daily time spent in LPA and MVPA. The time spent on sedentary behavior (SED = 0 - 99 counts min-1) (Freedson et al., 1998) was evaluated. The total daily time in MVPA and SED bouts was also analyzed, by adding the continuous minutes spent in MVPA and SED, respectively, in periods ≥ 10 minutes. Values were calculated and adjusted according to the number of valid days and hours of wear per day (Sasaki et al., 2018). The analyses were performed using ActiLife version 6.13.3.

EB. It was assessed using a food frequency questionnaire based on previous studies (Andrade et al., 2012; Ferreira et al., 2014). For this study, fruits and vegetables were considered healthy eating indicators and soda drinks (or soft drink/artificial juice) unhealthy eating indicators (Brazil, 2021b). Consumption of fruits and vegetables was estimated based on the answers to the following questions: "In the past three months, how often did you eat fruit?" and "In the past three months, how often did you eat vegetables?". Consumption of soda drink (or soft drink/artificial juice) was estimated based on the answers to the

questions: “In the past three months, how often did you drink soda (e.g.: common; light/diet)?” and “In the past three months, how often did you drink sweetened beverages (with sugar or artificial sweeteners, e.g.: powdered juices, juice cartons, energy drinks, etc.)?”. The answer options for the consumption of fruits and vegetables and consumption of soda drinks were daily; weekly; monthly; rarely; never. The number of times that the food item was consumed was asked considering frequency (e.g.: daily - 1 time/day; weekly - 3 times/week; monthly - 2 times/month; rarely - 1 time/month, never - not once). For analysis purposes, the answers were grouped into four categories: consumes ≥ 5 days a week, consumes 3 to 4 days a week, consumes 1 to 2 days a week; rarely/never consumes.

Anthropometry. Were assessed body mass (BM), height, and waist circumference (WC). BM was measured using a calibrated digital scale accurate to 0.1 kg. Height was measured using a portable stadiometer accurate to 0.1 cm. WC was measured using an inelastic tape accurate to 0.1 cm, placed at the midpoint between the iliac crest and the last rib, without compressing any tissue. Body mass index (BMI) was calculated by dividing BM in kilograms by squared height in meters. The procedures described by the International Society for the Advancement of Kinanthropometry (ISAK) (Stewart et al., 2011) were used.

QOL. The general question of the questionnaire “World Health Organization QOL”, short version (Fleck et al., 2000), was used: “Considering the past two weeks, how would you rate your QOL?”. The answer options were: “very bad”, “bad”, “neither bad nor good”, “good” and “very good”. In this study, the percentage of participants with negative (very bad, bad, neither bad nor good) or positive (good and very good) QOL was calculated.

2.9 Sample calculation

Using GPower version 3.1.9.4, we identified that the minimum sample size for the variables PA and EB (primary markers of the VAMOS) would be 37 participants per group. A significance level of 5% was considered, the statistical power of 80%, non-randomization of groups, a correlation between observations at the three moments of the study of 0.5 (mean correlation), and ES of 0.15 (small effect) (Cohen, 1988).

2.10 Data analysis

Intra and intergroup comparisons were made for the outcomes of PA, EB, anthropometry, and QOL. For quantitative variables, the bidirectional analysis of variance for repeated measures (Two-Way ANOVA) was applied after confirmation of the sphericity assumption (Mauchly’s test), followed by Bonferroni's post hoc test. For variables, whose sphericity was violated, the analyses were adjusted using the Greenhouse-Geisser correction. The method of generalized estimating equations was applied to the intra and intergroup comparison of the variables analyzed categorically. The adopted level of significance was 5% ($p < 0.05$). Effect size (ES) was calculated to verify the magnitude of the differences, using Cohen's d. An ES of up to 0.49 was considered small, 0.50 to 0.79 was considered moderate, and 0.80 or more was considered high (Cohen, 1988).

The analyses were performed using two methods: per the protocol and intention to treat. In the per-protocol method, only participants whose data were collected at the three moments were included and who attended 75% of the meetings of the VAMOS Program (GI) or participated in counseling (CG) were included. In the intention-to-treat method, all participants evaluated in pre-intervention were included. However, all participants who dropped out during the study were also invited for post-intervention and maintenance reassessments. In the case of missing values, we opted for data imputation using the technique of replacing the missing value with the last observed value (Almeida et al., 2015). Also, to characterize the sample, descriptive analyses used absolute and relative frequency measures for categorical variables. The chi-square test was used to determine the significance of differences in study participants’ characteristics at the pre-intervention moment. Statistical

analyses were performed using SPSS version 22.0.

3. Results

Of the 265 users, 125 were part of the IG (55.2 ± 12.9 years), and 140 were part of the CG (55.9 ± 12.9 years). Table 1 presents the general characteristics of both groups at the pre-intervention moment. There were no differences between IG and CG participants concerning sex, age group, race, marital status, education, current occupation, average monthly family income, morbidity, and nutritional status ($p > 0.05$).

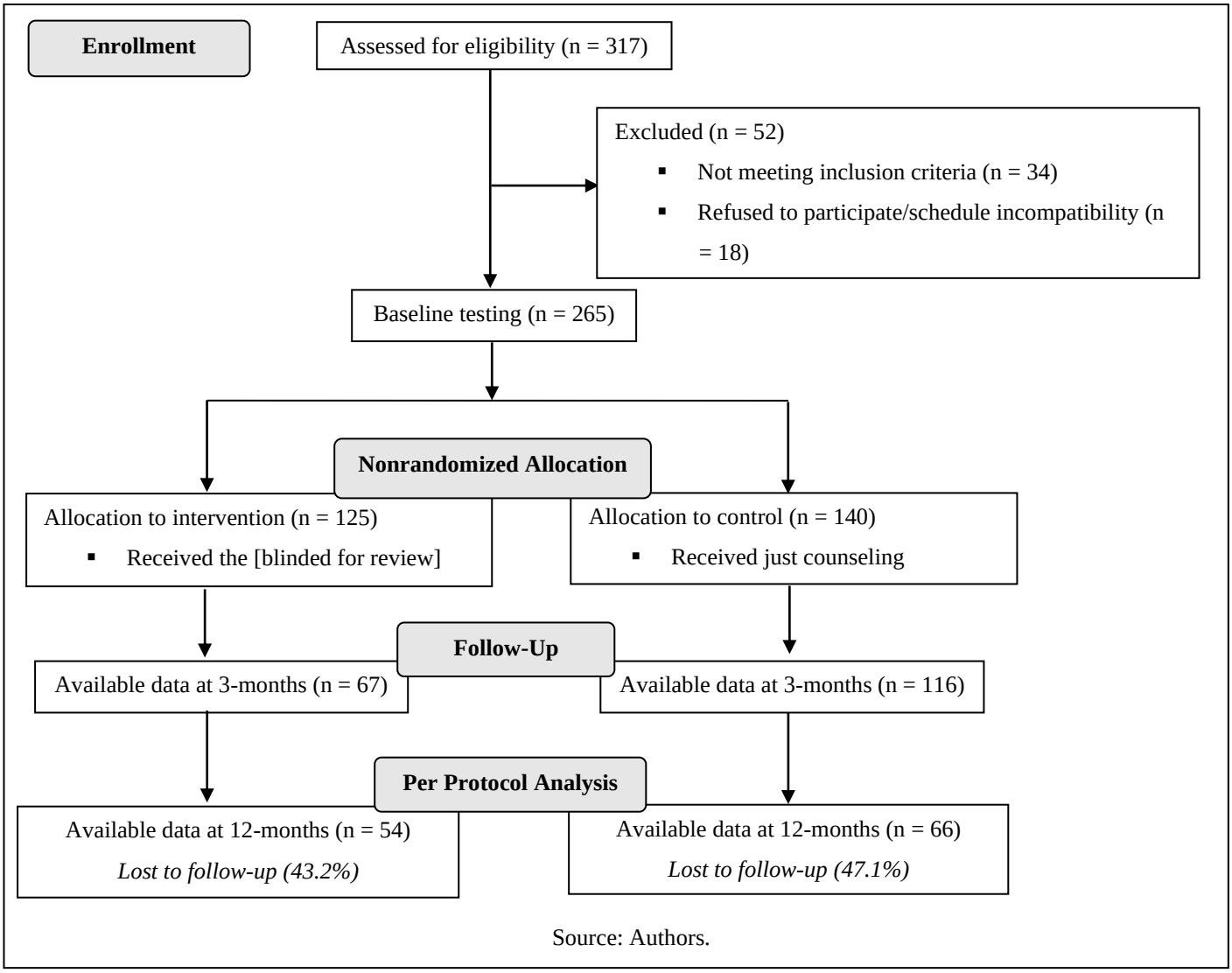
Table 1. General characteristics of the participants in the intervention group and the control group in the pre-intervention (n = 265). Florianópolis, Brazil, 2016-2017.

Variables	IG (n = 125)	CG (n = 140)	*p* value[a]
Sex *% female*	87.2 (109)	87.9 (123)	1.000
Age group *% adults*	60.8 (76)	52.9 (74)	0.215
Race *% whites*	76.8 (96)	75.7 (106)	0.886
Marital status *% without partner*[b]	54.4 (68)	51.4 (72)	0.712
Educational level *% complete basic education or higher*	71.2 (89)	62.9 (88)	0.154
Professional occupation *% without occupation*[c]	62.4 (78)	67.9 (95)	0.368
Average monthly family income *% ≤ 3 MW*[d]	59.2 (74)	62.1 (87)	0.781
Morbidity *% with disease*	92.8 (116)	87.1 (122)	0.188
Nutritional status *% overweight/obesity*[e]	82.4 (103)	72.9 (102)	0.078

Abbreviations: IG, intervention group; CG, control group; MW, minimum wage. Notes: [a]Chi-square test; [b]single, separated or widowed; [c]unemployed, retired or pensioner; [d]MW quoted at US$ 275,00 for the year 2016 (June); [e]Body Mass Index ≥ 25.0 kg/m². Source: Authors.

At the post-intervention moment, 183 users participated in the assessments (IG = 67; CG = 116), representing 69.1% of the initial study sample (183/265). Twelve months after the end of the intervention (maintenance), 120 users participated in the assessments (IG = 54; CG = 66), representing 45.3% of the initial study sample (120/265) (Figure 1). Losses in post-intervention and maintenance were related to users who could not be found to schedule the reassessments or did not show up on the scheduled reassessment day. Also, some subjects refused to continue participating in the study.

Figure 1. Flowchart of the study.



Source: Authors.

Table 2 shows the daily minutes spent in PA and SED in both groups. An isolated effect of time was found for the variables LPA ($F = 7.132$; $p = 0.001$), total PA ($F = 5.749$; $p = 0.004$), and SED ($F = 5.749$; $p = 0.004$). Both groups showed a reduced daily time spent in LPA and total PA and an increase in SED's daily time from pre-intervention to maintenance and from post-intervention to maintenance. No statistically significant effects were found in time, group, or interaction for the daily time spent in MVPA, MVPA bouts, and SED bouts ($p > 0.05$). In the intention-to-treat analysis, group vs. time interaction was observed for the daily time spent on bouts of MVPA ($F = 3.835$; $p = 0.024$), and there was an increase in the IG from pre-intervention to maintenance. Also, results with a tendency similar to the per-protocol analyses were observed for the other variables (only isolated effect of time for LPA, and total PA, and SED).

Table 2. Daily time spent in light physical activity, moderate and vigorous physical activity, total physical activity, and sedentary behavior by participants of the intervention and control groups, in the pre-intervention, post-intervention, and maintenance moments. Florianópolis, Brazil, 2016-2019.

	Per protocol					***Intention to Treat***				
	IG (n = 47)	**CG (n = 49)**	**Group**	**Time**	**Interaction**	**IG (n = 107)**	**CG (n = 125)**	**Group**	**Time**	**Interaction**
Variables	**Average ± SD**	**Average ± SD**				**Average ± SD**	**Average ± SD**			
LPA, min/day			0.120	**0.001**	0.122			0.182	**< 0.001**	0.147
Pre-intervention	515.52 ± 94.29	540.06 ± 103.96				517.37 ± 99.13	532.74 ± 105.83			
Post-intervention	522.22 ± 105.20	535.85 ± 104.52				517.95 ± 104.57	527.93 ± 111.26			
Maintenance	472.82 ± 118.73*#	523.72 ± 110.13*#				493.37 ± 112.04*#	521.14 ± 114.44*#			
ES Post x Pre	0.06	-0.04				0.00	-0.04			
ES Post x Maintenance	-0.39	-0.15				-0.22	-0.10			
MVPA, min/day			0.163	0.581	0.112			0.436	0.522	0.062
Pre-intervention	47.23 ± 26.09	45.50 ± 33.44				50.69 ± 30.08	51.06 ± 34.58			
Post-intervention	52.37 ± 31.52	44.21 ± 36.93				53.30 ± 31.94	49.42 ± 36.64			
Maintenance	56.54 ± 33.65	42.31 ± 32.85				55.55 ± 33.42	49.34 ± 35.23			
ES Post x Pre	0,17	-0,03				0.08	-0.04			
ES Post x Maintenance	0.30	-0.09				0.15	-0.04			
Total PA, min/day			0.291	**0.004**	0.268			0.316	**0.001**	0.256
Pre-intervention	562.75 ± 106.07	585.56 ± 110.94				568.07 ± 113.35	583.81 ± 112.84			
Post-intervention	574.59 ± 115.84	580.06 ± 113.94				571.26 ± 116.43	577.36 ± 119.06			
Maintenance	529.36 ± 120.54*#	566.04 ± 113.72*#				548.92 ± 119.07*#	570.49 ± 120.00*#			
ES Post x Pre	0.10	-0.04				0.02	-0.05			
ES Post x Maintenance	-0.29	-0.17				-0.16	-0.11			
SED, min/day			0.291	**0.004**	0.268			0.316	**0.001**	0.256
Pre-intervention	397.24 ± 106.07	374.43 ± 110.94				391.92 ± 113.35	376.18 ± 112.84			
Post-intervention	385.40 ± 115.84	379.93 ± 113.94				388.73 ± 116.43	382.63 ± 119.06			

Maintenance	430.63 ± 120.54*#	393.95 ± 113.72*#				411.07 ± 119.07*#	389.50 ± 120.00*#			
ES Post x Pre	-0.10	0.04				-0.02	0.05			
ES Post x Maintenance	0.29	0.17				0.16	0.11			
MVPA *Bouts*, min/day			0.308	0.097	0.369			0.745	0.302	**0.024**
Pre-intervention	13.31 ± 13.63	12.63 ± 17.91				14.59 ± 17.44	16.49 ± 19.56			
Post-intervention	17.90 ± 17.19	15.16 ± 21.49				17.09 ± 18.16	15.81 ± 20.55			
Maintenance	19.51 ± 19.36	13.53 ± 19.53				18.31 ± 19.47*	15.42 ± 19.90			
ES Post x Pre	0.29	0.12				0.13	-0.03			
ES Post x Maintenance	0.37	0.04				0.20	-0.05			
SED *Bouts*, min/day			0.240	0.097	0.511			0.219	0.052	0.648
Pre-intervention	317.84 ± 106.40	282.68 ± 123.33				313.93 ± 114.65	293.29 ± 122.09			
Post-intervention	306.44 ± 113.70	293.78 ± 128.98				310.12 ± 117.03	296.96 ± 125.36			
Maintenance	332.88 ± 115.43	304.78 ± 122.93				324.42 ± 116.42	303.40 ± 123.55			
ES Post x Pre	-0.10	0.08				-0.03	0.02			
ES Post x Maintenance	0.13	0.17				0.09	0.08			

Abbreviations: IG, intervention group; CG, control group; SED, sedentary behavior; LPA, light physical activity; MVPA, moderate and vigorous physical activity; PA, physical activity; SD, standard deviation; ES, effect size. Notes: Values with statistical significance are in bold; *$p \leq 0.05$ versus pre-intervention; #$p \leq 0.05$ versus post-intervention. Source: Authors.

Table 3 shows the frequency of weekly consumption of food items considered indicators of healthy and unhealthy eating in both groups. Group vs. time interaction was observed for the variable's weekly consumption of vegetables (Wald test = 9.514; p = 0.009) and soda drinks (Wald test = 8.264; p = 0.016). An increase in the consumption of healthy foods and reduction in the consumption of unhealthy foods were identified only in the IG participants from pre- to post-intervention and the soda drinks from pre-intervention to maintenance. Additionally, an isolated effect of time was found in weekly fruit consumption (Wald test = 11.001; p = 0.004), with an increase in both groups from pre- to post-intervention and post-intervention to maintenance. In the intention-to-treat analysis, only an isolated effect of time was found for the variable weekly fruit consumption (Wald test = 9.527; p = 0.009), with an increase in both groups from pre- to post-intervention and from post-intervention to maintenance. There was an increase in both groups from pre- to post-intervention for weekly consumption of vegetables (Wald test = 6.602; p = 0.037). Finally, for weekly consumption of soda drinks (Wald test = 12.882; p = 0.002), there was a reduction in both groups from pre-intervention to maintenance.

Table 3. Frequency of weekly consumption of food items considered indicators of healthy and unhealthy eating by participants of the intervention and control groups, in the pre-intervention, post-intervention, and maintenance moments. Florianópolis, Brazil, 2016-2019.

	Per protocol					***Intention to Treat***				
Variables	**IG (n = 54)**	**CG (n = 66)**	**Group**	**Time**	**Interaction**	**IG (n = 125)**	**CG (n = 140)**	**Group**	**Time**	**Interaction**
Healthy eating indicators	**% (n)**	**% (n)**				**% (n)**	**% (n)**			
Fruits, consumption			0.319	**0.004**	0.214			0.954	**0.009**	0.143
Pre-intervention										
≥ 5 days a week	72.2 (39)	68.2 (45)				68.8 (86)	70.7 (99)			
3 to 4 days a week	1.9 (1)	9.1 (6)				6.4 (8)	10.0 (14)			
1 to 2 days a week	9.3 (5)	9.1 (6)				11.2 (14)	9.3 (13)			
Rarely/never	16.7 (9)	13.6 (9)				13.6 (17)	10.0 (14)			
Post-intervention										
≥ 5 days a week	85.2 (46) *	77.3 (51) *				76.8 (96) *	75.0 (105) *			
3 to 4 days a week	9.3 (5) *	1.5 (1) *				8.8 (11) *	5.0 (7) *			
1 to 2 days a week	1.9 (1) *	10.6 (7) *				8.0 (10) *	12.1 (17) *			
Rarely/never	3.7 (2) *	10.6 (7) *				6.4 (8) *	7.9 (11) *			
Maintenance										
≥ 5 days a week	81.5 (44) *	72.7 (48) *				74.4 (93) *	73.6 (103) *			
3 to 4 days a week	7.4 (4) *	9.1 (6) *				8.8 (11) *	8.6 (12) *			
1 to 2 days a week	3.7 (2) *	10.6 (7) *				8.8 (11) *	11.4 (16) *			
Rarely/never	7.4 (4) *	7.6 (5) *				8.0 (10) *	6.4 (9) *			
Vegetables, consumption			0.311	**0.040**	**0.009**			0.061	**0.037**	0.112
Pre-intervention										
≥ 5 days a week	61.1 (33)	66.7 (44)				68.8 (86)	65.7 (92)			
3 to 4 days a week	14.8 (8)	15.2 (10)				12.0 (15)	14.3 (20)			
1 to 2 days a week	16.7 (9)	16.7 (11)				15.2 (19)	13.6 (19)			

Rarely/never	7.4 (4)	1.5 (1)				4.0 (5)	6.4 (9)			
Post-intervention										
≥ 5 days a week	85.2 (46) †*	69.7 (46)				81.6 (102) *	70.0 (98) *			
3 to 4 days a week	7.4 (4) †*	12.1 (8)				7.2 (9) *	10.7 (15) *			
1 to 2 days a week	5.6 (3) †*	9.1 (6)				8.8 (11) *	10.0 (14) *			
Rarely/never	1.9 (1) †*	9.1 (6)				2.4 (3) *	9.3 (13) *			
Maintenance										
≥ 5 days a week	75.9 (41)	63.6 (42)				76.8 (96)	67.1 (94)			
3 to 4 days a week	13.0 (7)	18.2 (12)				10.4 (13)	13.6 (19)			
1 to 2 days a week	7.4 (4)	12.1 (8)				9.6 (12)	11.4 (16)			
Rarely/never	3.7 (2)	6.1 (4)				3.2 (4)	7.9 (11)			
Unhealthy eating indicators	**% (n)**	**% (n)**				**% (n)**	**% (n)**			
Soda drinks, consumption			0.072	**0.001**	**0.016**			0.406	**0.002**	0.051
Pre-intervention										
≥ 5 days a week	24.1 (13)	19.7 (13)				20.8 (26)	20.7 (29)			
3 to 4 days a week	9.3 (5)	16.7 (11)				12.0 (15)	8.6 (12)			
1 to 2 days a week	22.2 (12)	21.2 (14)				20.0 (25)	22.9 (32)			
Rarely/never	44.4 (24)	42.4 (28)				47.2 (59)	47.9 (67)			
Post-intervention										
≥ 5 days a week	13.0 (7) †*	27.3 (18)				16.0 (20)	21.4 (30)			
3 to 4 days a week	5.6 (3) †*	15.2 (10)				8.0 (10)	10.0 (14)			
1 to 2 days a week	13.0 (7) †*	15.2 (10)				16.0 (20)	21.4 (30)			
Rarely/never	68.5 (37) †*	42.4 (28)				60.0 (75)	47.1 (66)			
Maintenance										
≥ 5 days a week	13.0 (7) *	19.7 (13)				16.0 (20) *	17.1 (24) *			
3 to 4 days a week	5.6 (3) *	4.5 (3)				7.2 (9) *	5.0 (7) *			

1 to 2 days a week	9.3 (5) *	16.7 (11)	15.2 (19) *	25.7 (36) *
Rarely/never	72.2 (39) *	59.1 (39)	61.6 (77) *	52.1 (73) *

Abbreviations: IG, intervention group; CG, control group; %, relative frequency; n, number of participants. Notes: Values with statistical significance are in bold; $^{\dagger}p \leq 0.05$ versus CG in the pre-intervention; $^{*}p \leq 0.05$ versus pre-intervention. Source: Authors.

Table 4 shows data of anthropometry in both groups. The groups showed statistically significant differences at the pre-intervention moment for BM and WC ($p < 0.05$). However, the two-way ANOVA for repeated measures identified a significant effect of group vs. time interaction ($F = 6.431$; $p = 0.002$) for WC. This datum shows that the IG participants reduced WC from pre- to post-intervention ($p = 0.001$) and from pre-intervention to maintenance ($p < 0.001$). No significant effects of time, group, or interaction were found for BM and BMI ($p > 0.05$). In the intention-to-treat analysis, the results were like those found in the per-protocol analysis. Also, there was an isolated group effect for BMI ($F = 6.839$; $p = 0.009$). That is, the groups were different regardless of time.

Table 4. Body mass, waist circumference, and body mass index by participants of the intervention and control groups, in the pre-intervention, post-intervention, and maintenance moments. Florianópolis, Brazil, 2016-2019.

	Per protocol					***Intention to Treat***				
	IG (n = 54)	**CG (n = 66)**	**Group**	**Time**	**Interaction**	**IG (n = 125)**	**CG (n = 140)**	**Group**	**Time**	**Interaction**
Variables	**Average ± SD**	**Average ± SD**				**Average ± SD**	**Average ± SD**			
Body mass, kg			**0.013**	0.220	0.468			**0.003**	0.107	0.264
Pre-intervention	79.01 ± 14.81†	71.72 ± 15.78				80.08 ± 18.67†	74.54 ± 16.92			
Post-intervention	78.36 ± 14.35	71.78 ± 15.34				79.96 ± 18.61	73.59 ± 15.07			
Maintenance	78.19 ± 13.99	71.44 ± 15.39				79.88 ± 18.51	73.39 ± 15.12			
ES Post x Pre	-0.04	0.00				-0.00	-0.05			
ES Post x Maintenance	-0.05	-0.01				-0.01	-0.07			
WC, cm			0.182	**0.003**	**0.002**			**0.049**	**0.021**	**0.025**
Pre-intervention	98.62 ± 12.04†	93.45 ± 14.09				99.24 ± 13.66†	95.20 ± 13.11			
Post-intervention	95.71 ± 10.79*	93.16 ± 14.22				97.98 ± 13.32*	94.98 ± 13.41			
Maintenance	95.22 ± 11.54*	93.72 ± 13.59				97.87 ± 13.52*	95.35 ± 13.04			
ES Post x Pre	-0.25	-0.02				-0.09	-0.01			
ES Post x Maintenance	-0.28	0.01				-0.10	0.01			
BMI, kg/m^2			0.056	0.266	0.441			**0.009**	0.231	0.462
Pre-intervention	30.65 ± 5.76	28.56 ± 5.35				31.16 ± 6.92	29.28 ± 6.41			
Post-intervention	30.40 ± 5.63	28.61 ± 5.28				31.11 ± 6.90	29.00 ± 5.90			
Maintenance	30.32 ± 5.41	28.48 ± 5.40				31.07 ± 6.83	28.92 ± 5.95			
ES Post x Pre	-0.04	0.00				-0.00	-0.04			
ES Post x Maintenance	-0.05	-0.01				-0.01	-0.05			

Abbreviations: IG, intervention group; CG, control group; BMI, body mass index; WC, waist circumference; SD, standard deviation; kg, kilogram; m, meter; cm, centimeter; ES, effect size. Notes: Values with statistical significance are in bold; †$p \leq 0.05$ versus CG in the pre-intervention; *$p \leq 0.05$ versus pre-intervention. Source: Authors.

Table 5 shows the QOL in both groups. Group vs. time interaction was observed (Wald test = 12.475; p = 0.002). The percentage of participants with a positive QOL perception increased only in the IG, from pre- to post-intervention and pre-intervention to maintenance. In the intention-to-treat analysis, no significant effects of group, time, or interaction were found to perceive the QOL (p > 0.05).

Table 5. Perception of quality of life by participants of the intervention and control groups, in the pre-intervention, post-intervention, and maintenance moments. Florianópolis, Brazil, 2016-2019.

	Per protocol					***Intention to Treat***				
	IG (n = 54)	**CG (n = 66)**	**Group**	**Time**	**Interaction**	**IG (n = 125)**	**CG (n = 140)**	**Group**	**Time**	**Interaction**
Variables	**% (n)**	**% (n)**				**% (n)**	**% (n)**			
QL, perception			0.785	**0.008**	**0.002**			0.079	0.330	0.136
Pre-intervention										
Positive	44.4 (24) †	65.2 (43)				42.4 (53)	58.6 (82)			
Negative	55.6 (30) †	34.8 (23)				57.6 (72)	41.4 (58)			
Post-intervention										
Positive	74.1 (40) *	62.1 (41)				52.8 (66)	57.1 (80)			
Negative	25.9 (14) *	37.9 (25)				47.2 (59)	42.9 (60)			
Maintenance										
Positive	68.5 (37) *	65.2 (43)				50.4 (63)	57.1 (80)			
Negative	31.5 (17) *	34.8 (23)				49.6 (62)	42.9 (60)			

Abbreviations: IG, intervention group; CG, control group; QL, quality of life; %, relative frequency; n, number of participants. Notes: Values with statistical significance are in bold; †p ≤ 0.05 versus CG in the pre-intervention; *p ≤ 0.05 versus pre-intervention. Source: Authors.

4. Discussion

The VAMOS Program seems to be effective for PHC users. Some variables showed an isolated effect of time; however, the results cannot be attributed exclusively to the intervention in these cases. The present study considered that the intervention positively impacted the variables in which interaction was identified (group vs. time). Thus, the main findings indicate an increase in the consumption of vegetables, a decrease in soda drinks consumption, a reduction in WC, and an improvement in the QOL (per-protocol analysis). Furthermore, the intervention maintained the gains obtained about the consumption of soda drinks and WC. Considering the intention-to-treat analysis, there was an increase in bouts of MVPA at the end of the intervention and maintenance.

The VAMOS promoted an increase of 17.1% and 25.5% in the daily time spent in AFMV bouts (period of uninterrupted exposure in AFMV) after the intervention and 12 months after its end, respectively. In other studies, the VAMOS has also been shown to be effective in increasing levels of PA in hypertensive patients (Gerage et al., 2017), in users of the Health Academy Program (known in Brazil as PAS) (Meurer et al., 2019), and in technical public servants - administrative (Souza et al., 2020). This may reflect their strategies that encourage PA's practice, regardless of volume, intensity, and domain. The habit of practicing PA, irrespective of levels, is seen as an initial stage for adopting a more active and healthier lifestyle (Ajzen & Madden, 1986; Dumith et al., 2009).

The VAMOS is based on global public health guidelines and recommends that PA be practiced for at least 150 minutes/week at moderate intensity or 75 minutes/week at a vigorous intensity. The combined practice of MVPA is encouraged as it provides additional health benefits and is associated with a reduced risk of all-cause mortality (Brazil, 2021a; World Health Organization, 2020). Thus, the VAMOS encourages the increase of PA levels to be progressive, which seems to be feasible and effective so that the recommended levels are reached (Chastin et al., 2019).

The increase in MVPA practice, observed in the present study, emphasizes the VAMOS's importance in promoting PA in PHC users. It seems the participants continued to increase the practice of MVPA when evaluated 12 months after the end of the intervention. In contrast, in a previous study (Meurer et al., 2020) that evaluated the maintenance of the gains obtained six months after the end of the intervention, the benefits acquired were not sustained or improved. According to the authors, it involves PAS users who already had a more active and healthier lifestyle. The participants already met the minimum recommendations for PA and considered the time of practice sufficient before the intervention. These are factors that may have influenced the non-maintenance of behaviors. However, for example, it is no use for people to be encouraged to become physically active through interventions if there are no suitable places for this. Evidence shows how much the built environment influences people to practice PA (Carlin et al., 2017). The VAMOS encourages its participants to explore the territory in which they were inserted and to make use of the spaces available to adopt and maintain an active and healthy lifestyle. This may have positively influenced the maintenance of PA. Also, in Florianópolis, the city where the present study was carried out, PA's practice has been encouraged through the presence of public leisure spaces and specific structures, most of which are of good quality (Manta et al., 2018). This fact may also be associated with the high prevalence of adults and the older adults practicing leisure-time PA (45.2%), compared with other Brazilian capitals (Brazil, 2020).

As for EB, participants had not been in the habit of consuming vegetables or used to consume them infrequently. After the three-month intervention, the participants increased their weekly consumption of these foods. Also, they reduced the consumption of soda drinks after the intervention and 12 months after its end. These results are similar to those found in other researches that studied VAMOS in different contexts and reinforce that the intervention strategies promote positive changes in EB (Gerage et al., 2017; Meurer et al., 2019; Souza et al., 2020).

The VAMOS uses the Dietary Guidelines for the Brazilian Population (Brazil, 2014) as a basis for actions to change

EB. This document addresses aspects ranging from food choice to its preparation, encouraging the increase in the consumption of fresh or minimally processed foods, and the reduction in the consumption of processed and ultra-processed foods. One of the VAMOS strategies is the incentive to increase the consumption of healthy foods and to reduce the consumption of unhealthy foods - poor in nutrients and harmful to health.

In Florianópolis, 43.7% of the population has the habit of consuming healthy foods (Brazil, 2020). This result can be attributed in part to the city's tax incentives, specifically for markets called Directly from the Countryside, which commercialize fruits and vegetables. Also, there are farmer's markets in all the capital's neighborhoods. The municipality has inequalities in the distribution and access to healthy food, and the most economically vulnerable areas are the most affected ones (Corrêa et al., 2017). Thus, in addition to the efforts that have already been made, public and environmental policies need to develop interventions and investments in all areas that influence human nutrition, as the low consumption of healthy food continues, even when availability is not an issue (Claro et al., 2016; Mason-D'Croz et al., 2019; Passos et al., 2020; Turner et al., 2020). Therefore, implementing the VAMOS in PHC is essential to minimize this problem, encouraging the population to have a healthy diet and raising awareness about its health benefits. The reduction in WC after the intervention and maintenance period may be associated with PA and EB improvement of the intervention participants.

The increased WC has an inverse relationship to the behaviors recommended by VAMOS (Gerage et al., 2017; Meurer et al., 2019; Souza et al., 2020). The presence of abdominal fat signals that the person should care for their health (National Institutes of Health, 2013); reducing or maintaining the measure is important and can lead to a better QOL. The QOL is in line with the findings of the VAMOS about the QOL and its effectiveness was shown in the present study, similarly to a previous study (Gerage et al., 2017). An active and healthy lifestyle has been, increasingly, a decisive factor for the QOL, as it is associated with lower health expenses, lower risk of chronic diseases, and reduction in premature mortality (Nahas, 2017). Thus, in PHC's context, educational strategies proposed collectively are important tools to attain a health-related QOL (Soeiro et al., 2019).

The VAMOS proposes to its participants the development of small goals - goals that are possible to achieve in the short term and incorporated into the routine. As the participants progress, the goals are resized, aiming at empowerment and autonomy to maintain an active and healthy lifestyle sustainably (Benedetti et al., 2017). Thus, individual gains are significant; however, significant changes are often difficult to detect. This finding can be attributed to the short intervention time (three months) and perhaps not enough (Fjeldsoe et al., 2011).

Behavior change varies from person to person. Some tend to adhere to the received information more quickly, while others need a longer follow-up period (Bandura, 2004). Also, the intervention strategies that help people initiate changes may not necessarily have the same effect on maintaining behavior (Samdal et al., 2017).

A systematic review carried out behavioral interventions shows how difficult it is to maintain the obtained gains, regardless of the intervention and follow-up period. Less than 40% of interventions manage to maintain gains in all the analyzed variables; however, 72% show positive results in at least one variable (Fjeldsoe et al., 2011). The absence/contact of the intervention leader and of the group, which consists of a support network, the lack of self-efficacy for change, and the intervention strategies' strategies, are some factors that may be related to maintenance difficulties.

Given this context, the present study carried out in the PHC did not evaluate only the effectiveness of community intervention in its real conditions, but mainly whether the intervention's benefits were sustained over 12 months after its end. Thus, considering the study's characteristics and results, we highlight the potential of the VAMOS. Interventions targeted at behavior change are essential in public health. It is necessary to educate the population so that they have the autonomy to care for their health. So, the health system is relieved, and it is possible to apply resources to prevention and health promotion

instead of focusing on disease treatment and rehabilitation.

The present study has some limitations that must be considered when interpreting the results. The UBS did not implement the VAMOS simultaneously. The sample was selected by convenience sampling, the groups were not parallel, there was no randomization, and the evaluators were not blinded.

However, we believe that the strengths of this study should be highlighted. The intervention was carried out in real public health conditions and conducted by the health professionals themselves, differing from other studies. We used the RE-AIM framework, which is utilized internationally to evaluate programs to increase public health impact but is not widely used in Latin America. As it is a behavior change program, it presents, in addition to pre-and post-intervention data, maintenance data, obtained by monitoring long-term outcomes. He used an objective measure to measure PA and healthy and unhealthy eating indicators recommended by the Brazilian Ministry of Health.

5. Conclusion

The VAMOS, version 2.0, constitutes an important strategy for adults and older adult users of PHC who wish to change their behaviors and adopt a more active and healthier lifestyle. Although it is a program developed by researchers, evidence shows that VAMOS has an innovative protocol to promote health and can be offered together with PHC services.

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