Article

JHP

Journal of Health Psychology
2016, Vol. 21(10) 2156–2167

DOI: 10.1177/1359105315572451
hpq.sagepub.com
SAGE

Predictors of adherence in a prevention program for patients with metabolic syndrome

Nathália Susin[1], Raquel de Melo Boff[1], Martha Walig Brusius Ludwig[1], Ana Maria Pandolfo Feoli[1], Andreia Gustavo da Silva[1], Fabricio Elder Macagnan[2] and Margareth da Silva Oliveira[1]

Abstract

The study objectives were (1) comparison of baseline characteristics between individuals with metabolic syndrome, adhering/not adhering to a primary prevention program *modificação do estilo de vida e risco cardiovascular*; and (2) determination of risk factors for program adherence. The sample included 127 participants with mean age (±standard deviation) of 49.58 (±7.77) years, participating in the *modificação do estilo de vida e risco cardiovascular* between 2010 and 2012. Results show that program adherence predictors were age (odds ratio: 1.134, 95% confidence interval: 1.106–1.833); practicing physical exercise (odds ratio: 1.322, 95% confidence interval: 1.115–7.589); self-efficacy for regular eating habits (odds ratio: 2.044, 95% confidence interval: 1.184–3.377); low binge eating scores (odds ratio: 1.922, 95% confidence interval: 1.118–3.974); and low isolation and depression scores (odds ratio: 0.721, 95% confidence interval: 0.322–0.917).

Keywords

chronic disease, intervention treatment adherence, lifestyle, metabolic syndrome

Introduction

Chronic conditions are the main cause of death or disability worldwide, representing about 63% of mortality per year. A large proportion of cases are related to cardiovascular diseases (CVDs), with metabolic syndrome (MetS) being one of the main risk factors (Gami et al., 2007; World Health Organization (WHO), 2012). This issue has become one of the key challenges in public health as it relates to a complex disorder associated with abdominal obesity, dyslipidemia, hyperglycemia, and hypertension, and whose prevalence is on the rise (Schmidt et al., 2011). Furthermore, MetS predicts CVD emergence better than each of the risk factors in isolation (Stone and Saxon, 2005). It is estimated, therefore, that the high

[1]Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS), Brazil
[2]Universidade Federal de Ciências da Saúde de Porto Alegre, Brazil

Corresponding author:
Raquel de Melo Boff, Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS), Av. Ipiranga 6681, Porto Alegre 90619-900, Brazil.
Email: rmboff@hotmail.com

mortality is associated, other than prevalence, with a lack of control of these risk factors (Foster, et al., 2013).

Treatment must focus on lifestyle changes, including diet, physical activity, and pharmacological agents in order to combat specific risk factors (Foreyt, 2005). As a consequence, multidisciplinary approaches aimed at a healthy lifestyle have been shown effective not only in reducing the syndrome criteria, but also in improving functional capacity and decreasing cardiovascular risk (Pérez et al., 2010). However, although being an ideal intervention, there are many barriers to the practical application of lifestyle modifications due to the time they demand and the greater required involvement by both health practitioners and patients, shaping proactive choices that patients often choose not to make (Sullivan, 2006).

The rates for non-adherence to medication and lifestyle changes for the treatment of chronic conditions range from 50 to 80 percent, and patients frequently adhere more easily to medication than a healthy lifestyle, precisely because of the complexity and commitment of this latter treatment (Cohen, 2009). Adherence can be understood as the willingness to cooperate, actively take part, and complete the treatment (Colombo, et al., 2014; Moroshko et al., 2011). Attendance and completion of change lifestyle intervention is associated with better health outcomes. Thus, to improve this adherence, it is important to understand the reasons for noncompletion of the treatment, considering demographic, psychological, and social factors, as well as those related to the disease and treatment (Gilmour and Williams, 2011; Prochaska et al., 2006; Sousa et al., 2014). Adherence where treatment involves diet and/or physical exercise is a matter of concern for health practitioners, particularly for patients with MetS for whom therapy plays a decisive role (Busnello et al., 2011).

Increased adherence is linked to improvements in MetS parameters, although evidence is limited regarding behavioral and motivational factors that may help patients keep to the proposed interventions (Fappa et al., 2008). Identifying the reasons for non-adherence to interventions makes it possible to focus assistance programs on people with less chance of following and benefiting from treatment, especially at-risk groups (Simmons et al., 2010).

The few scientific research on aspects related to adherence to lifestyle improvement programs in patients with MetS (Reiners et al., 2008) motivated the goals of this study, which aimed to (1) compare baseline characteristics between those patients with MetS who adhered to and did not adhere to a primary prevention program for cardiovascular risk individuals and (2) identify factors associated with program adherence.

Methods

Analysis data were taken from the *modificação do estilo de vida e risco cardiovascular* (MERC; lifestyle and cardiovascular risk modification) research program conducted at the Rehabilitation Center of São Lucas Hospital, at the Pontifical Catholic University of Rio Grande do Sul (PUCRS), Brazil. MERC is an interdisciplinary study with participation from the schools of pharmacy, nursing, nutrition, physical therapy, and psychology.

A randomized trial was conducted with three intervention methods: standard intervention (SI), individual intervention (II), and group intervention (GI). SI followed the main guidelines for MetS clinical management and was an II with no medication, performed by nursing staff who gave direction regarding self-care, diet, and the performance of physical exercise, based on recommendations from the Brazilian Guidelines for the Diagnosis and Treatment of MetS (DBSM-I, 2005). GI consisted of weekly group meetings in which nursing, physical therapy, and nutrition staff approached health-related issues. A motivational intervention, based on the Transtheoretical Model (TTM) of Change (Velasquez et al., 2001), was also performed by psychology staff at these meetings. II involved the same psychological intervention, however, on an individual basis and was combined with weekly nutrition appointments

and the performance of exercise monitored by physical therapy staff, following the DBSM-I (2005).

The randomization and scheduling of initial assessments was performed by staff members (physical therapists, psychologists, nurses, nutritionists) after signed informed consent was obtained. The MERC program lasted 3 months, and participants of the II and GI groups were instructed to notify staff if they were unable to attend any appointments. Those participants with excessive absences or who requested to no longer be part of the program were excluded and categorized as "did not complete the program," which was usually related to one of the following reasons: health, incompatible time, treatment method, or absence from the reassessment. Individuals who concluded the 3-month intervention were categorized as "completed the program." This study was approved by the PUCRS Research Ethics Committee under protocol number 10/05153.

Since 2010, 354 participants have been recruited for screening, and of these, 199 attended an initial evaluation to determine whether they met study inclusion criteria. A total of 127 participants presented the inclusion criteria and were randomized into groups II (43), GI (41), and SI (43). The program was completed by 81 participants and the losses during follow-up were self-reported and described as follows: 24 participants from the SI group, 8 abandoned, 16 for other reasons; 16 participants from the GI group, 4 with lack of motivation, 5 due to health problems, 2 with unavailability, 5 for other reasons; and 15 participants from the II group, 6 due to health problems, 4 with unavailability, 5 for other reasons.

The results of the main study showed that participants receiving Individual Treatment demonstrated significantly greater improvement than those receiving Group Treatment or the Control Treatment in the following outcomes: weight, body mass index (BMI), waist circumference (WC), amount of exercise per week, readiness to perform aerobic exercise 3–5 times per week, readiness to increase fiber intake, readiness to reduce sodium, and self-efficacy to regulate exercise. No differences were found between the Group Treatment and Control Treatment for any of the outcomes.

The sample of 127 volunteers diagnosed with MetS in line with the DBSM-I (2005) guidelines was classified according to the outcome of completed or did not complete the program, and the following variables were compared: sociodemographic data (including gender, age, and occupational status); MetS diagnosis components (DBSM-I, 2005); BMI and weight; binge eating (Binge Eating Scale—BES; Freitas et al., 2001); depression and anxiety (Adult Self Report—ASR; Achenbach and Rescorla, 2001); stress (Stress Symptom Inventory for Adults—SSIA; Lipp, 2000); practice of physical exercise and healthy eating habits; religiosity; motivation (Readiness to Change Ruler; Velasquez et al., 2001); and self-efficacy (self-efficacy scales for physical activity and eating habits; Bandura, 2006). Depression and anxiety were obtained from the ASR subscales of isolation and depression, and anxiety and depression, with normal, borderline, and clinical scores. Self-report scales were used in relation to religion and the practice of healthy eating habits and physical exercise.

Statistical Package for the Social Sciences (SPSS) software, version 17.0, was used to perform descriptive statistical analysis both through absolute and relative distribution (n; %) and mean plus standard deviation (SD), with the continuous distribution symmetry assessed through the Kolmogorov–Smirnov test. Pearson's chi-square test (χ^2) and Fisher's exact test were applied to the bivariate analysis among qualitative variables for the contingency tables in which at least 25 percent of the cell values presented an expected frequency lower than 5. Student's t-test was applied to continuous variables. Multivariate analysis was performed through unconditional binary logistic regression, using the backward selection procedure to test hypotheses of association between those who completed the program and the co-variables defined by bivariate analysis ($p \leqslant 0.250$). A statistical significance level of 5 percent was adopted.

Results

Data from a sample of 127 participants were analyzed and assessed at baseline in the MERC program between 2010 and 2012. Of these, 68.5 percent were working, 86.7 percent white, 59.1 percent women, and 40.9 percent men, with a mean age (±SD) of 49.58 (±7.77) years. All participants had a diagnosis of MetS, with 113 (88.97%) considered obese (BMI ⩾ 30 kg/m^2) and the majority presenting WC (98.4%), triglycerides (66.9%), systolic blood pressure (SBP) (66.1%), and diastolic blood pressure (DBP) (64.6%) values above those established by the DBSM-I (2005).

Most of the sample participants were married and living with a partner (62.2%) and had completed high school (40.9%) or university (48.8%). Many of the individuals were sedentary (65.4%) with moderate perceived self-efficacy for both maintaining a routine of physical exercise (51.2%) and regular eating habits (56.7%), which were associated with 50–80 percent ability to remain on the required diet and exercise regime, even when presented with tempting situations. Approximately one-third (40.94%) presented symptoms of anxiety and depression and 57.5 percent were stressed.

A total of 63.77 percent ($n=81$) of participants were able to complete the program; this showed no significant association with modes of intervention. Adherence to the treatment was significantly associated with age ($p<0.01$), occupational status ($p<0.05$), binge eating ($p<0.05$), religiosity ($p<0.05$), motivation ($p<0.05$), and depression ($p<0.05$), as illustrated in Table 1. The proportion of cases that completed treatment was significantly higher ($p<0.01$) than those not completing, with the latter being younger, not employed, not practicing religion, having a severe binge eating problem, and less motivation. In relation to depression, individuals who completed the program were more associated with a normal classification, while those not completing were associated with a clinical depression classification.

A binary logistic regression was applied to the analysis in order to assess the predictive power of treatment by describing the individual contribution of each independent variable on adherence or non-adherence to the program. Independent models for groups of variables were generated: sociodemographic (gender, age, occupation, and religion); self-efficacy (exercise and diet); comorbidities (binge eating, isolation and depression, anxiety and depression, and stress); and lifestyle (diet quality and physical activity).

According to results shown in Table 2, the sociodemographic group of variables proved to be relevant in predicting adherence to the program in relation to being employed (odds ratio (OR): 3.533; 95% confidence interval (CI): 1.471–8.485), practicing religion (OR: 2.645; 95% CI: 1.019–6.866), and age (OR: 1.080; 95% CI: 1.022–1.140). The self-efficacy group of variables demonstrated that having a high perceived self-efficacy for regulating eating habits was significant for adhering to the program (OR: 5.811; 95% CI: 1.274–26.518).

In terms of comorbidities, the scores for binge eating were found to be strongly associated with program adherence, since for every unit increase in score for this variable, there was a reduction of 6.4 percent in adherence to the program (OR: 0.936, 95% CI: 0.880–0.974), that is, lower scores for compulsion were associated with remaining on the treatment plan. The absence of stress (OR: 2.527, 95% CI: 1.066–5.987) also proved to be a significant variable for predicting treatment adherence.

The variables related to lifestyle showed no significant risks in predicting adherence to treatment, both for the practice of physical activity (OR: 1.850, 95% CI: 0.836–4.096) and in relation to the type of eating (OR: 1.364: 95% CI: 0.066–2.818).

The first logistical regression model considered variables showing a level of significance lower than or equal to 0.250 after bivariate analysis, with these being age, occupation, practice of physical exercise, self-efficacy for regular eating habits, binge eating (median ± SD), religiosity, anxiety and depression, isolation and depression, motivation, and the MetS criteria WC and BMI.

Table 1. Characteristics of participants according to the treatment outcome of adhered (A) or did not adhere (NA).

Variables	Total ($n=127$)[a]	Outcome[b]		p
		A ($n=81$)	NA ($n=46$)	
Age (median ± SD)	49.58 ± 7.77	50.89 ± 7.2	47.28 ± 8.1	0.015[c]
Occupation[d]				
Employed	87 (68.5)	61 (70.1)	26 (29.9)	0.046[e]
Not employed	40 (31.5)	20 (50)	20 (50)	
Performs exercise[d]				
Yes	44 (34.6)	32 (72.7)	12 (27.3)	0.182[e]
No	83 (65.4)	49 (59)	34 (41)	
Self-efficacy to regulate eating habits[d]				
Low	30 (23.6)	16 (53.3)	14 (46.7)	0.116[f]
Moderate	72 (56.7)	45 (62.5)	27 (37.5)	
High	25 (19.7)	20 (80)	5 (20)	
Binge eating (mean ± SD)	15.05 ± 8.53	13.68 ± 7.5	17.46 ± 9.6	0.025[c]
Binge eating[d]				
None	82 (64.6)	58 (70.7)	24 (29.3)	0.049[f]
Moderate	30 (23.6)	17 (56.7)	13 (43.3)	
Severe	15 (11.8)	6 (40)	9 (60)	
Religiosity[d]				
Practices religion	102 (80.3)	70 (68.6)	32 (31.4)	0.039[e]
No religion	25 (19.7)	11 (44)	14 (56)	
Anxiety and depression[d]				
Normal	75 (59.1)	53 (70.7)	22 (29.3)	0.074[g]
Borderline	24 (18.9)	15 (62.5)	9 (37.5)	
Clinical	28 (22)	13 (46.4)	15 (53.6)	
Isolation and depression[d]				
Normal	101 (79.5)	69 (68.3)	32 (31.7)	0.025[f]
Borderline	15 (11.8)	9 (60)	6 (40)	
Clinical	11 (8.7)	3 (27.3)	8 (72.7)	
Motivation	9.10 ± 1.36	9.28 ± 1.11	8.78 ± 1.68	0.049[c]
MetS criteria (median ± SD)				
WC	112.5 ± 8.8	111.75 ± 8.88	113.82 ± 8.51	0.202[c]
BMI (kg/m^2) (mean ± SD)	34.9 ± 3.5	34 ± 3.58	35.08 ± 3.30	0.096[c]

SD: standard deviation; WC: waist circumference; BMI: body mass index; MetS: metabolic syndrome.
[a]Percentage of total sample.
[b]Percentage based on total for each category.
[c]Student's *t*-test for independent groups adopting equal variance.
[d]Results presented as *n*.
[e]Pearson's chi-square test for continuous variables.
[f]Fisher's exact test with Monte Carlo method.
[g]Pearson's chi-square test.

The initial (or saturated) model of logistic regression correctly classified 64.2 percent ($n=52$) of cases who completed and 41.3 percent ($n=19$) of those who did not complete the program, presenting a total correct classification percentage of 52.7 percent of cases. To determine the final (reduced) model, the backward method was used to select variables with real

Table 2. Predictors significantly associated with adherence to the MERC program.

Variables	Total sample ($n=127$)[a]	Adhered ($n=81$)[b]		OR	95% CI OR[£]	p
		n	%			
Sociodemographic						
Gender[a]						
Female	75 (59.1)	46	61.3	1.092	0.409–1.703	0.459
Male	52 (40.9)	35	67.3	1.0	–	
Age (years)	49.58 ± 7.77	50.89 ± 7.2		1.080	1.022–1.140	0.006
Occupation[a]						
Employed	87 (68.5)	61	70.1	3.533	1.471–8.485	0.007
Not employed	40 (31.5)	20	50.0	1.0		
Religiosity[a]						
Practices religion	102 (80.3)	70	68.6	2.645	1.019–6.866	0.046
No religion	25 (19.7)	11	44.0	1.0	–	
Self-efficacy						
To regulate exercise[a]						
Low	37 (29.1)	24	64.9	1.0	–	
Moderate	65 (51.2)	40	61.5	0.663	0.266–1.655	0.663
High	25 (19.7)	17	68.0	0.433	0.107–1.746	0.433
To regulate eating habits[a]						
Low	30 (23.6)	16	53.3	1.0	–	
Moderate	72 (56.7)	45	62.5	1.706	0.673–4.324	0.261
High	25 (19.7)	20	80.0	5.811	1.274–26.518	0.023
Comorbidities						
Binge eating (median ± SD)	15.05 ± 8.53	13.68 ± 7.5		0.936	0.880–0.974	0.003
Anxiety and depression[a]	58.4 ± 6.8	57.7 ± 6.4		0.994	0.916–1.078	0.878
Isolation and depression[a]	55.1 ± 5.5	54.3 ± 4.9		0.946	0.863–1.036	0.232
Stress[a]						
Yes	73 (57.5)	49	67.1	1.0		
No	54 (42.5)	32	59.3	2.527	1.066–5.987	0.035
Lifestyle						
Performs physical activities[a]						
Yes	44 (34.6)	32	72.7	1.850	0.836–4.096	0.164
No	83 (65.4)	49	59.0	1.0	–	
Eating habits[a]						
Healthy	67 (52.8)	45	67.2	1.364	0.660–2.818	0.129
Unhealthy	60 (47.2)	36	60.0	1.0	–	

MERC: *modificação do estilo de vida e risco cardiovascular*; SD: standard deviation.
Model parameters: pseudo-$R^2=0.459$; "−2 Log Likelihood = 122.436; Hosmer–Lemeshow test ($p=0.602$); chi-square test ($\chi^2=4.961$; $p>0.05$).
[a]Percentage of total sample.
[b]Percentages obtained from the total of each of the listed variables in the regression model.
[£]odds ratio function

potential to predict adherence (which excludes a variable from the model at each new step until the ideal model for the sample is defined).

The final model was set in five steps and correctly classified 91.3 percent ($n=74$) of participants who completed the program and 67.4 percent

Table 3. Significant predictors associated with adherence to the MERC treatment program (backward selection five steps).

Variables	Total sample ($n=127$)[a]	Adhered ($n=81$)[b]		OR	95% CI OR[c]	p
		n	%			
Age (years)	49.58 ± 7.77	50.89 ± 7.2		1.134	1.106–1.833	0.003
Perform exercise						
Yes	44 (34.6)	32	72.7	1.322	1.115–7.589	0.018
No	83 (65.4)	49	59.0	1.0		
Religiosity						
Practices religion	102 (80.3)	70	68.6	1.966	1.221–4.392	0.027
No religion	25 (19.7)	11	44.0	1.0		
Self-efficacy to regulate eating habits						
Low	30 (23.6)	16	53.3	1.0	–	
Moderate	72 (56.7)	45	62.5	0.588	0.419–2.566	0.322
High	25 (19.7)	20	80.0	2.044	1.184–3.377	0.020
Binge eating[a]	15.05 ± 8.53	13.68 ± 7.5		1.922	1.118–3.974	0.011
Anxiety and depression[a]	58.4 ± 6.8	57.7 ± 6.4		0.889	0.578–1.067	0.069
Isolation and depression[a]	55.1 ± 5.5	54.3 ± 4.9		0.721	0.322–0.917	0.042

MERC: *modificação do estilo de vida e risco cardiovascular*; OR: odds ratio; CI: confidence interval.
Model parameters: pseudo-$R^2=0.523$; "−2 Log Likelihood = 119.228; Hosmer–Lemeshow test ($p=0.791$); chi-square test ($\chi^2=5.577$; $p>0.05$). Model adjusted for the following variables: age, perform exercise, religiosity, self-efficacy to regulate eating habits, binge eating, isolation and depression, and stress.
[a]Percentages obtained based on the total sample.
[b]Percentages obtained based on the total of each of the listed variables in the regression model.

($n=31$) of those who did not complete, with a total percentage of correct classification of 79.3 percent for this sample, as seen in Table 3.

Of the variables selected, those that demonstrated relevance as predictors of treatment adherence were age (OR: 1.134, 95% CI: 1.106–1.833); performing physical activity (OR: 1.322, 95% CI: 1.115–7.589); religion (OR: 1.966, 95% CI: 1.221–4.392); high rating for self-efficacy to regulate eating behavior (OR: 2.044, 95% CI: 1.184–3.377); binge eating (OR: 1.922, 95% CI: 1.118–3.974); and isolation and depression (OR: 0.721, 95% CI: 0.322–0.917).

The probability of completing the program increased proportionally in relation to age (OR: 1.134) and as data for binge eating (OR: 1.922) decreased. Low scores for isolation and depression were also more likely to lead to adherence to treatment (OR: 0.721). Additionally, it was found that participants who performed regular physical activity (OR: 1.322), practiced religion (OR: 1.966), and had a "high" rating for regular eating habits (OR: 2.044) showed a high probability of completing the treatment program.

Discussion

Psychological aspects such as anxiety, depression, and stress are also related to the development of MetS (Räikkönen et al., 2007) and were present in this study sample. Moreover, people with more severe depressive symptoms, anger expressions, hostility, and pessimism show a significantly higher syndrome prevalence (Cohen et al., 2010; Gilmour and Williams, 2011).

Such features must be assessed as depression may hamper lifestyle changes and medication adherence (Dunbar et al., 2008). Depression was a predictive variable in this study for treatment adherence, since participants with no depression were four times more likely to complete their therapy. A direct relationship has been shown between depressive symptoms and lack of adherence to weight loss programs

(Somerset et al., 2011). This is also true of interventions aimed at the performance of physical exercise, with depression affecting observance of the proposed actions (Morris and Williams, 2009). Depression, therefore, has a positive correlation with a nonhealthy lifestyle, suggesting that even mild depression may have an impact on adherence to healthy behaviors by patients with MetS (Bonnet et al., 2005).

Binge eating is often related to obesity, diabetes, and MetS (Hudson et al., 2010). The present research showed that participants not affected by binge eating were six times more likely to complete treatment, highlighting the importance of this variable as a significant predictor of intervention adherence. This is consistent with findings in the literature, which indicate compulsion as a barrier not only for treatment adherence, but also for maintaining any achieved weight loss (Lillis et al., 2011). As a result, both eating habits and the cultural and psychological meaning of eating for patients with chronic metabolic disorders have been the subject of study, taking into consideration the difficulties in adhering to necessary changes (Bassi et al., 2014).

It is important to consider the presence of these psychological aspects when dealing with patients with MetS, as well as other chronic conditions (Dunbar et al., 2008; Hudson et al., 2010). Training programs that include a well-balanced diet and physical activity show better results when allied to psychological follow-up, highlighting the importance of a multidisciplinary team when dealing with these patients (Pugliese et al., 2007). However, these interventions are characterized by high rates of avoidance, especially when adherence to them is an important element for preventing the complications caused by MetS (Busnello et al., 2011).

The number of participants completing treatment in this study was significantly higher, contradicting literature findings that point to lower rates (Delamater, 2006; Groeneveld et al., 2009; Marcon et al., 2011). Adherence is understood as a *continuum*, since the patient attitude before treatment is related to their motivational stage and self-efficacy or confidence regarding change (Prochaska et al., 2006).

Many patients are not ready for immediate modification and should work on their progress through the stages of change (Cohen, 2009). For this reason, the TTM of behavior change focuses on readiness to change stages and on decisional scales (analysis of the pros and cons of changing). The pros for changing start to assume a higher value than the cons as progress is made through the stages and motivation increases as a consequence (Prochaska et al., 1992; Velicer et al., 1990).

This research demonstrated a significant association between the motivation to change and adherence to the intervention. The latter has been evidenced as a predictive factor of self-monitoring and weight loss, as well as appointment attendance (Webber et al., 2010), and can be influenced by self-efficacy, defined as the level to which individuals believe in their ability to reach the desired goal (Bandura, 1977). Self-efficacy has two components that, although distinct, are related: confidence in performing and maintaining changes and temptation to relapse. As well as the decisional balance, self-efficacy systematically varies according to the motivational stage. More motivated individuals, therefore, usually experience greater confidence and lower temptation (Prochaska et al., 2006), which is in agreement with this study finding as both motivation and self-efficacy were relevant to those who completed treatment.

The majority of participants indicated that they felt able to face tempting situations in relation to maintaining regular exercise and eating well, with self-efficacy for regular eating habits being a predictive factor for treatment adherence. It has been shown that self-efficacy for healthy eating habits increases the chance of continuation of treatments aimed at lifestyle change and is responsible for the achievement and maintenance of the intended goals (Delahanty et al., 2012). Moreover, individuals who were already accustomed to taking part in physical exercise before the program began displayed a better chance of completing treatment, perhaps already having feelings of motivation

for that type of behavior, which the greater part of the sample commented on as being the most difficult aspects to change. Reports from the literature point out that physical activity benefits are maximized by continued adherence and maintenance in the long term, even though this situation is often difficult to achieve (Bosak, 2012), especially in the elderly (Lee, et al., 2012; Yeom et al., 2011).

In this study, participants aged over 50 years were seven times more likely to complete the program. This is possibly because persons over 65 years of age account for an increasing proportion of the population, having a higher prevalence of MetS and increased cardiovascular risk (Butler et al., 2006). Thus, many of the participants sought out the program as they had lost a loved one due to these complications. Moreover, as the majority of the sample was formed of working people and home providers, they may have had concerns regarding leaving their family abandoned if their health conditions were to become worse. That is to say, adherence is related to previous experiences and to perceived personal risk and vulnerability (Cohen, 2009). These data confirm findings in the literature that point to age as an important factor for participation in this form of treatment, with individuals who failed to complete treatment being younger than those who followed it through to the end (Groeneveld et al., 2009).

The importance of religion was highlighted with it being a predictive factor, since individuals who declared themselves as having a religion were four times more likely to complete the treatment program. Religious practice has an important effect on the interpretation and management of traumatic events, promoting resilience, helping to cope with pain, and increasing confidence when facing adversities. Therefore, religious beliefs are related to adherence and achieving better therapeutic results (Peres et al., 2007). High levels of religious belief are associated with better wellness and mental health states (Moreira-Almeida and Koenig, 2006), with religiosity being an aspect often approached in health practice due to its influence on cure and illness processes (Faria and Seidl, 2005).

Further research is necessary to determine the mechanisms that affect the relationship between religiosity and other predictive and adherent behaviors in the population with MetS, as treatment is a present-day challenge, not only in terms of the difficulty in adherence, but in maintaining this in the medium and long term.

Limitations

We have considered a number of variables in this study that could predict adherence or non-adherence to treatment, since early participation of patients is extremely important to the success of any intervention. However, adherence is associated with lifestyle change and reduction in criteria for MetS, which may also have happened to participants who did not complete the treatment. Many of those who did not continue with the 3-month treatment plan may have taken up the practice of regular exercise and a healthy diet. This could be related to the stage of readiness to change, a variable that was not assessed after the departure of those who did not complete the program.

This study involved a small and specific sample of participants aged 30–59 years in receipt of medical advice to make lifestyle changes. These people were well educated and financially able to perform the suggested changes, something that is not a reality for many people in developing countries. Furthermore, some of the variables investigated, such as frequency of meetings, topics discussed, and lack of time to continue consultations, among others, could not be associated with adherence, or non-adherence, to the program.

Whereas the study was intended to focus on significant behavior change variables according to the TTM of Change approach, the research contributes to an understanding of the predictive characteristics that lead to adherence to treatment for lifestyle changes in patients with MetS.

Conclusion

Despite having set habits, most participants of the MERC program concluded the treatment, with age, physical exercise, self-efficacy for eating habits, binge eating, depression, and practicing religion being predictors for adherence to the intervention. It is important when assessing these factors during patient triage to plan not just the treatment, but to also identify abandonment risks. It is only through an understanding of the reasons why patients remain in treatment and what differentiates them from those who give up that it will be possible to establish mechanisms to increase the probability of program adherence, considering that adherence to the treatment program can contribute to the maintenance of lifestyle change and reduction of long-term MetS criteria.

Funding

This research has received funds from the Brazilian government through the Conselho Nacional de Desenvolvimento Científico e Tecnológico - CNPq and Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – CAPES.

References

Achenbach TM and Rescorla LA (2001) *Manual for the ASEBA School-Age Forms & Profiles*. Burlington, VT: Research Center for Children, Youth & Families, University of Vermont.

Bandura A (1977) Self-efficacy: Toward a unifying theory of behavior change. *Psychological Review* 84: 191–215.

Bandura A (2006) Guide for constructing self-efficacy scales. In: Pajares F and Urdan T (eds) *Self-Efficacy Beliefs of Adolescents*. Greenwich: Information Age Publishing, pp. 307–337.

Bassi N, Karagodin I, Wang S, et al. (2014) Lifestyle modification for metabolic syndrome: A systematic review. *The American Journal of Medicine* 127(12): 1242.e1–1242.e10.

Bonnet F, Irving K, Terra JL, et al. (2005) Depressive symptoms are associated with unhealthy lifestyles in hypertensive patients with the metabolic syndrome. *Journal of Hypertension* 23(3): 611–617.

Bosak K (2012) Managing metabolic syndrome: Focus on physical activity. *The Journal for Nurse Practitioners* 8(3): 206–211.

Busnello FM, Bodanese LC, Pellanda LC, et al. (2011) Intervenção nutricional e o impacto na adesão ao tratamento em pacientes com síndrome Metabólica. *Arquivos Brasileiros de Cardiologia* 97(3): 217–224.

Butler J, Rodondi N, Zhu Y, et al. (2006) Metabolic syndrome and the risk of cardiovascular disease in older adults. *Journal of the American College of Cardiology* 47: 1595–1602.

Cohen BE, Panguluri P, Na B, et al. (2010) Psychological risk factors and the metabolic syndrome in patients with coronary heart disease: Findings from the Heart and Soul Study. *Psychiatry Research* 175(1–2): 133–137.

Cohen SM (2009) Concept analysis of adherence in the context of cardiovascular risk reduction. *Nursing Forum* 44: 25–36.

Colombo O, Ferretti VV, Ferraris C, et al. (2014) Is drop-out from obesity treatment a predictable and preventable event? *Nutrition Journal* 13: 2–7.

DBSM-I (2005) I Brazilian guidelines for the diagnosis and treatment of metabolic syndrome. *Arquivos Brasileiros de Cardiologia* 84(1): 3–28.

Delahanty LM, Peyrot M, Shrader PJ, et al. (2013) Pretreatment, psychological, and behavioral predictors of weight outcomes among lifestyle intervention participants in the Diabetes Prevention Program (DPP). *Diabetes Care* 36(1): 34–40.

Delamater AM (2006) Improving patient adherence. *Clinical Diabetes* 24(2): 71–77.

Dunbar JA, Reddy P, Davis-Lameloise N, et al. (2008) Depression: An important comorbidity with metabolic syndrome in a general population. *Diabetes Care* 31(12): 2368–2373.

Fappa E, Yannakoulia M, Pitsavos C, et al. (2008) Lifestyle intervention in the management of metabolic syndrome: Could we improve adherence issues? *Nutrition* 24: 286–291.

Faria JB and Seidl EMF (2005) Religiosidade e enfrentamento em contextos de saúde e doença: Revisão da literatura. *Psicologia Reflexão e Crítica* 18(3): 381–389.

Foreyt JP (2005) Need for lifestyle intervention: How to begin. *The American Journal of Cardiology* 96: 11E–14E.

Foster MC, Rawlings AM, Coresh J, et al. (2013) Cardiovascular risk factor burden, treatment, and control among adults with chronic kidney disease in the United States. *American Heart Journal* 166(1): 150–156.

Freitas S, Lopes CS, Coutinho W, et al. (2001) Tradução e adaptação para o português da Escala de Compulsão Alimentar Periódica. *Revista Brasileira de Psiquiatria* 23(4): 215–220.

Gami AS, Witt BJ, Howard DE, et al. (2007) Metabolic syndrome and risk of incident cardiovascular events and death: A systematic review and meta-analysis of longitudinal studies. *Journal of the American College of Cardiology* 49(4): 403–414.

Gilmour J and Williams L (2011) Type D personality is associated with maladaptive health-related behaviours. *Journal of Health Psychology* 17(4): 471–478.

Groeneveld IF, Proper KI, Beek AJ, et al. (2009) Factors associated with non-participation and drop-out in a lifestyle intervention for workers with an elevated risk of cardiovascular disease. *International Journal of Behavioral Nutrition and Physical Activity* 6: 80.

Hudson JI, Lalonde JK, Coit CE, et al. (2010) Longitudinal study of the diagnosis of components of the metabolic syndrome in individuals with binge-eating disorder. *The American Journal of Clinical Nutrition* 91(6): 1568–1573.

Lee I-M, Shiroma EJ, Lobelo F, et al. (2012) Effect of physical inactivity on major non-communicable diseases worldwide: An analysis of burden of disease and life expectancy. *Lancet* 380: 219–229.

Lillis J, Hayes SC and Levin ME (2011) Binge eating and weight control: The role of experiential avoidance. *Behavior Modification* 35(3): 252–264.

Lipp MEN (2000) *Manual do Inventário de Sintomas de Stress para Adultos de Lipp (ISSL)*. São Paulo, Brazil: Casa do Psicólogo.

Marcon ER, Gus I and Neumann CR (2011) Impacto de um programa mínimo de exercícios físicos supervisionados no risco cardiometabólico de pacientes com obesidade mórbida. *Arquivos Brasileiros de Endocrinologia E Metabologia* 55(5): 331–338.

Moreira-Almeida A and Koenig HG (2006) Retaining the meaning of the words religiousness and spirituality. *Social Science & Medicine* 63(4): 843–845.

Moroshko I, Brennan L and O'Brien P (2011) Predictors of dropout in weight loss interventions: A systematic review of the literature. *Obesity Reviews* 12: 912–934.

Morris JH and Williams B (2009) Optimising long-term participation in physical activities after stroke: Exploring new ways of working for physiotherapists. *Physiotherapy* 95(3): 227–233.

Peres JFP, Simão MJP and Nasanello AG (2007) Spirituality, religiousness and psychotherapy. *Revista de Psiquiatria Clinica* 34(1): 58–66.

Pérez IP, Zapata MA, Cervantes CE, et al. (2010) Cardiac rehabilitation programs improve metabolic parameters in patients with the metabolic syndrome and coronary heart disease. *Journal of Clinical Hypertension* 12(5): 374–379.

Prochaska JM, Prochaska JO and Johnson SS (2006) Assessing readiness for adherence to treatment. In: O'Donohue WT and Levensky ER (eds) *Treatment Adherence: A Practical Handbook for Health Care Providers*. Thousand Oaks, CA: SAGE, pp. 35–46.

Prochaska JO, DiClemente CC and Norcross JC (1992) In search of how people change: Applications to addictive behaviour. *American Psychologist* 47: 102–114.

Pugliese R, Zanella MT, Blay SL, et al. (2007) Eficácia de uma Intervenção Psicológica no Estilo de Vida para Redução do Risco Coronariano. *Arquivos Brasileiros de Cardiologia* 89(4): 225–230.

Räikkönen K, Matthews KA and Kuller LH (2007) Depressive symptoms and stressful life events predict metabolic syndrome among middle-aged women: A comparison of World Health Organization, Adult Treatment Panel III, and International Diabetes Foundation definitions. *Diabetes Care* 30(4): 872–877.

Reiners AAO, Azevedo RCS, Vieira MA, et al. (2008) Produção bibliográfica sobre adesão/não-adesão de pessoas ao tratamento de saúde. *Ciência & Saúde Coletiva* 13(2): 2299–2306.

Schmidt MI, Duncan BB, Silva GA, et al. (2011) Chronic non-communicable diseases in Brazil: Burden and current challenges. *Lancet* 377(9781): 1949–1961.

Simmons RK, Sluijs EMF, Hardeman W, et al. (2010) Who will increase their physical activity? Predictors of change in objectively measured physical activity over 12 months in the ProActive cohort. *BMC Public Health* 10: 226.

Somerset SM, Graham L and Markwell K (2011) Depression scores predict adherence in a dietary weight loss intervention trial. *Clinical Nutrition* 30(5): 593–598.

Sousa P, Gaspar P, Fonseca H, et al. (2014) Lifestyle and Treatment adherence among

overweight adolescents. *Journal of Health Psychology*. Epub ahead of print 1 May. DOI:10.1177/1359105314531469.

Stone NJ and Saxon D (2005) Approach to treatment of the patient with metabolic syndrome: Lifestyle therapy. *The American Journal of Cardiology* 96 (4A): 15E–25E.

Sullivan VK (2006) Prevention and treatment of the metabolic syndrome with lifestyle intervention: Where do we start? *Journal of the American Dietetic Association* 106: 668–671.

Velasquez M, Maurer G, Crouch C, et al. (2001) *Group Treatment for Substance Abuse: A Stages-of-Change Therapy Manual*. New York: Guilford Press.

Velicer WF, DiClemente CC, Rossi JS, et al. (1990) Relapse situations and self-efficacy: An integrative model. *Addictive Behaviors* 15: 271–283.

Webber KH, Tate DF, Ward DS, et al. (2010) Self-monitoring and weight loss in a 16-week Internet behavioral weight loss intervention. *Journal of Nutrition Education and Behavior* 42: 161–167.

World Health Organization (WHO) (2012) Health topics: Chronic diseases. Available at: http://www.who.int/topics/chronic_diseases/en/

Yeom HA, Jung D and Choi M (2011) Asian adherence to physical activity among older adults using a geographic information system: Korean National Health and Nutrition Examinations Survey IV. *Nursing Research* 5(2): 118–127.