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Journal of Sport and Health Science 2 (2013) 242–248

www.jshs.org.cn

Process and outcome evaluation of the "No more smoking! It's time for physical activity" program

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Received 1 October 2012; revised 28 January 2013; accepted 20 May 2013

Abstract

Purpose: The aim of this study was to evaluate the program "No more smoking! It's time for physical activity", with a mixed methods design, in order to collect information to improve the program for future applications.
Methods: Forty patients across five anti-smoking clinics in Central Greece completed the program. Counselors' records and participants' questionnaires and interviews were used as data in order to evaluate the programs' process and outcome.
Results: Quantitative measures before and after the program revealed significant differences on smoking behavior, physical activity (PA) behavior, self-efficacy, and smoking habit measures. Qualitative data implied that the promotion of PA as a cessation aid was perceived as positive by the participants and both participants' and counselors' statements were encouraging for the effectiveness of PA promotion during the program as a cessation-aid technique.
Conclusion: Evaluation of the "No more smoking! It's time for physical activity" program showed encouraging results. People who try to quit smoking can become more physically active through targeted intervention and they regard PA as a significant aid in their efforts to quit smoking.

Keywords: Counseling; Evaluation; Greek adults; Physical activity; Smoking cessation

1. Introduction

The relationship between smoking and physical activity (PA) appears to be quite complex.[1] Although some studies found no or a weak relationship,[2] the majority of recent studies show an inverse relationship between PA and smoking.[3,4] A study within the Greek population examined smoking habits in relation to PA. Results revealed that the more physically active people are the less they smoke,[5] and these results contribute to the prospect that PA is inversely related to the habit of smoking. The promotion of PA has the potential to become an aid strategy[6] regarding smoking cessation programs. Review studies summarising relevant results show that there is a positive association between initiating an attempt to quit smoking and engagement in PA[1,7] and patients who prepared themselves to stop smoking were more likely to increase their PA rates.[8] The promotion of PA is considered as a low-cost strategy for health care providers as they aid individuals to quit smoking.[9]

Both smokers[10] and smoking cessation counselors[11] have highlighted the use of PA as a valuable smoking cessation aid. Haddock et al.[10] examined beliefs of 36,012 young adults about potential risk reduction strategies for smokers. This 1-year longitudinal survey found that participants rated diet,

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Peer review under responsibility of Shanghai University of Sport

Production and hosting by Elsevier

http://dx.doi.org/10.1016/j.jshs.2013.06.001

PA, and low-yield cigarettes as providing the most healthy benefits regardless of their smoking status. Everson-Hock et al.[11] interviewed 11 trained smoking cessation advisors who promoted PA to their clients. Findings show that PA is a useful and easily performed cessation aid rather than a new behavior that has to be acquired, which might increase the sense of load/pressure to patients. They also suggested that PA could be promoted as a cessation aid and as part of a holistic lifestyle change consistent with a non-smoker's identity. Finally, advisors asserted that it is important to focus on the needs and capabilities of individual clients. Nademin et al.[12] collected both quantitative (questionnaires) and qualitative (focus group) data from 43 young college women. Participants reported that successful cessation interventions must include PA components, group-based meetings, eating tips, reminders of drawbacks to smoking, and use of technology.

PA may aid in smoking cessation by addressing physiological and psychosocial issues. Regular PA increases caloric expenditure, and therefore may increase metabolic rate and reduce the weight increase associated with smoking cessation.[13–15] Several smoking cessation interventions, from computer-generated tailored letters to intensive group-based interventions, which tried to help smokers strengthen their self-efficacy to abstain from smoking, had promising results indicating that self-efficacy can be increased using a range of methods including PA promotion.[16]

In the international literature, the integration of PA promotion as a cessation aid has been well perceived by the patients of a smoking cessation clinic. In Greece, where the never exercisers and regular smokers' percentages are amongst the higher in Europe, smokers might not be so receptive to a program that integrates these two behaviors.[17] Therefore, a smoking cessation counseling program, named "No more smoking! It's time for physical activity", that incorporates PA promotion as an additional quitting aid has been developed and pilot tested. The initial evaluation report[18] showed that 18 patients, from the 40 who completed the program, succeeded to increase their PA level during the program and managed to quit smoking for 1 year after the program. The description of the program and the early preliminary results have been published,[18] whereas, the purpose of this paper was to present the subsequent results from the additional measures that were tracking the program's applicability and effectiveness. The early preliminary results showed that the percentage of those who succeeded to quit smoking for 1 year was 45% of those who completed the program (18/40). The increase of the PA levels among the successful quitters was much higher than the non-successful quitters.[18] Subsequently, for the purpose of the present study, additional data were collected and analyzed to further evaluate the programs' process and outcome (applicability and effectiveness of the program).

2. Methods

2.1. Evaluation procedure

The research method that is often preferred in process and outcome evaluation relies on mixed methods design.[19] A triangulation mixed methods design was followed in this study and both qualitative and quantitative data were collected, analyzed separately and findings were combined in the discussion section.[20] The process evaluation provides information about what and what does not work in a program. Such information explains how a program operates and clarifies the program improvement requirements. The current process evaluation focused on how the integration of PA promotion was perceived by the counselors and the participants in relation to their efforts to quit smoking. Information for process evaluation was collected through the counselors' diaries and records during the intervention and through the participants' interviews at the end of the program. The outcomes evaluation provides information on whether a program has reached its aims. The current outcome evaluation focused on examining a) if significant differences on the following measures occurred: smoking behavior (pre-, post-, and follow-up), PA behavior (pre-, post-), self-efficacy (pre-, post-) and habit (pre-, post-), and b) participants' perceptions on the effectiveness of the integration of PA in the smoking cessation program. Information for the outcomes evaluation was collected through questionnaires assessing the targeted behaviors (smoking and PA), psychological variables (habit and self-efficacy) before and after the program, and the participants' interviews at the end of the intervention. Additional participants' quantitative data were collected 3, 6, and 12 months after the end of the program in order to estimate if the main outcome of the program (quitting smoking) had long-term effects.

2.2. Participants

Fifty adult patients from five anti-smoking clinics in the central Greece region were initially enrolled in the program. Ten participants did not finish the program. The remaining 40 (12 men and 28 women) (mean age: 45.6 years old) completed the intervention. The ethics committee of the University of Thessaly approved the study and all participants signed consent forms for participation.

2.3. Measures

2.3.1. Quantitative

Participants completed all the quantitative measures before and after the end of the intervention program.

(1) Self-efficacy. Individual's confidence to abstain from smoking in a variety of different situations was assessed using a 9-item[21] self-report measure of self-efficacy (e.g., how confident I am that I would not smoke, when I first get up in the morning). Responses were given on a 5-point scale, which were anchored by "Not at all confident" = 1 to "Extremely confident" = 5. An overall score of individual's confidence to abstain from smoking was calculated.
(2) Smoking habit. The habit of smoking cigarettes was measured with a 12-item Self-Report Habit Index,[22] which was slightly adapted in order to accommodate the present

behavior (e.g., smoking is something I would find hard not to do). Responses were given on a 7-point scale, which were anchored by "Disagree completely" = 1 to "Agree completely" = 7. Higher scores indicated a stronger habit.

(3) PA behavior. PA was assessed by the self-reported questionnaire of Godin and Shephard.[23] The questions assess the strenuous, moderate, and light PAs for more than 15 min during 1 week. Reported frequencies of strenuous, moderate, and light activities were multiplied by nine, five, and three, respectively. The total weekly leisure activity was calculated by summing the products of the separate components: total leisure activity score = (9 × strenuous) + (5 × moderate) + (3 × light).

(4) Smoking behavior. Participants answered the question, "How many cigarettes did you smoke yesterday?" The cigarettes smoked per day were used as the smoking behavior variable.

(5) Social desirability. Participants also completed the short version of the Crowne and Marlowe[24] Social Desirability Scale after the intervention, to control positively biased responses. Correlations between each measure and the social desirability scores were all non-significant (Table 1).

2.3.2. Qualitative data collection

(1) Interviews. Interviews were conducted in a semi-structured format, providing depth through probe questions.[25] Participants answered orally questions regarding their experiences from being physically active as a cessation aid within the counseling program that they attended. Two trained qualitative researchers conducted all interviews. Each interview lasted from 35 to 45 min for each participant and was conducted after appointments in a quiet room setting. Each interview was recorded and later transcribed verbatim.

(2) Counselors' diaries. Counselors assigned to the program kept records and detailed diaries of individual meetings with each participant. They recorded the procedure and kept detailed field notes with comments on issues that arose during the sessions. All PA related notes were then analysed to identify emerging themes.

(3) Qualitative data analysis. A content analysis "at the end"[26] was conducted with the assistance of two peer de-briefers. Data analysis was carried out both inductively and deductively. In the first inductive step, both transcribed interviews and counselors' diaries were used to identify raw data passages answering the process and outcome main evaluation questions. In the second step, a deductive approach was used; generation and categorisation of themes emerged from participants' answers. In the third step, an evaluation of themes was conducted.[27] Trustworthiness of the qualitative procedure was enhanced through the following five strategies:[28] 1) Prolonged engagement was attained by the involvement of three of the five researchers of this study as counselors and PA facilitators. They all spent time in the 10 treatment sessions and developed relationships and rapport with the participants in order to build trust. During this interaction it was also possible to identify the most relevant characteristics and elements as a way to attain depth through 2) persistent observation. 3) Member checking was carried out after the interviews. Each participant was asked to verify his/her interview by reading the transcription 2−5 days after the interview had been conducted. In order to achieve 4) inquiry audit, an external researcher, familiar with qualitative research, evaluated whether or not the findings, interpretations and conclusions were supported by the qualitative data. Finally, the use of multiple data collectors and multiple analysts contributed to the understanding of the phenomenon under investigation 5) analyst triangulation.

3. Results

3.1. Quantitative results

3.1.1. Preliminary analysis

Means ± SD and correlations of variables that were assessed immediately after the intervention are presented in Table 1. All scales showed adequate internal consistencies (α coefficients ranging from 0.84 to 0.93). More specifically, correlation analyses revealed negative low relationships between number of cigarettes after the intervention for self-efficacy ($r = -0.27$, $p = 0.09$) and exercise behavior ($r = -0.20$, $p = 0.22$), and positive moderate relationship with habit ($r = 0.35$, $p < 0.05$). Mean ± SD of the number of cigarettes as reported by the participants ($n = 40$) by time are the following: before the intervention = 17.38 ± 12.84, after the intervention =

Table 1
Means ± SD and correlations for all variables.

Measures	Means ± SD		Correlations ($n = 40$)							
	Pre-intervention	Post-intervention	1	2	3	4	5	6	7	8
Habit	5.50 ± 1.08	3.32 ± 1.55	−							
Self-efficacy	2.28 ± 0.65	3.72 ± 1.03	−0.92**	−						
Total leisure activity score	13.98 ± 23.41	44.50 ± 26.66	−0.21	0.29	−					
Strenuous exercise (times/week)	0.70 ± 1.34	2.15 ± 1.86	0.02	0.16	0.87**	−				
Moderate exercise (times/week)	0.88 ± 1.56	3.35 ± 2.08	−0.37*	0.33*	0.77**	0.40**	−			
Light exercise (times/week)	1.10 ± 2.00	2.80 ± 2.15	−0.31*	0.27	0.65**	0.33*	0.50*	−		
Number of cigarettes/day	17.38 ± 12.84	3.80 ± 7.71	0.35*	−0.27	−0.20	−0.11	−0.21	−0.18	−	
Social desirability			−0.13	0.13	−0.19	−0.22	−0.08	−0.10	−0.07	−

*$p < 0.05$, **$p < 0.01$.

3.80 ± 7.71, 3 months after the intervention = 4.43 ± 9.39, 6 months after the intervention = 4.43 ± 9.36, and 12 months after the intervention = 5.55 ± 10.11.

3.1.2. Main analysis

Kolmogorov−Smirnov tests were used to see if the distributions of the number of cigarettes before, immediately after, 3, 6, and 12 months after the intervention significantly differed from a normal distribution. The results revealed that the number of cigarettes before, D (40) = 0.21, $p < 0.001$, immediately after, D (40) = 0.44, $p < 0.001$, 3 months, D (40) = 0.43, $p < 0.001$, 6 months, D (40) = 0.41, $p < 0.001$, and 12 months after the intervention, D (40) = 0.38, $p < 0.001$, were significantly not normal. Friedman's analysis of variance (ANOVA) test showed that the number of cigarettes significantly changed over time $\chi^2(4) = 47.21$, $p < 0.001$. Wilcoxon tests were used to follow-up this finding using the Bonferroni correction and all effects were reported at a 0.005 level of significance. It appeared that the number of cigarettes decreased significantly immediately after the end of the intervention ($Z = -4.66$, $p < 0.001$), 3 months ($Z = -4.54$, $p < 0.001$), 6 months ($Z = -4.47$, $p < 0.001$), and 12 months ($Z = -4.34$, $p < 0.001$) after the intervention. There were no significant differences between the post measure and the follow-up measures (3, 6, and 12 months).

To test for differences before and after the intervention, in self-efficacy, habit of smoking, total leisure activity, light, moderate, and strenuous exercise, repeated measures multivariate analysis of variance (MANOVA) was performed. The analysis revealed significant multivariate effect, F (5, 35) = 17.76, $p < 0.001$, $\eta^2 = 0.72$, observed power = 1.00. Examination of the univariate effects revealed significant differences for self-efficacy, habit of smoking, total leisure activity, light exercise, moderate exercise and for strenuous exercise (Table 2). Examination of the pairwise comparisons using Bonferroni adjustment and the means revealed that immediately after the intervention self-efficacy improved ($p < 0.001$), the habit of smoking decreased ($p < 0.001$), total leisure activity, light exercise, moderate exercise, and strenuous exercise increased (all $p < 0.001$).

3.2. Qualitative results

The two main predetermined axes of all the qualitative data analysis were guided by two main research questions: 1) How the integrated technique of PA promotion was perceived by the participants? (indicating the process evaluation) and 2) How effective this integration was? (indicating the outcome evaluation of the program). Under these two main research questions the data were further categorised and the themes that emerged are presented in Table 3. A descriptive overview of the emerging themes follows.

Table 2
Repeated measures analysis of variance.

Measures	$F(1, 39)$	p	η^2	Observed power
Self-efficacy	59.82	< 0.001	0.61	1
Habit of smoking	56.22	< 0.001	0.59	1
Total leisure activity	63.87	< 0.001	0.62	1
Light exercise	29.20	< 0.001	0.43	1
Moderate exercise	49.26	< 0.001	0.56	1
Strenuous exercise	30.97	< 0.001	0.44	1

3.2.1. Process evaluation: participants' perceptions of the integration of PA

The emerging themes showed that participants perceived the integration of PA as a means to improve their health and as a way to develop a new identity. They saw PA as a way to manage their stress and tension, which derived from the withdrawal symptoms from cigarette cravings. There were several comments indicating that the more they managed to increase their PA levels the less they wanted to smoke. They highlighted the benefits of exercise on their own body and contrasted these benefits with the negative effects of smoking on their body. There were also comments showing that when they planned to attend the scheduled exercise sessions they did not want to smoke beforehand because they realised that this would lower their performance. In addition, they pointed out that their desire to smoke after exercise decreased from session to session. Participants also linked their increased PA to increased awareness of other health-related behaviors, such as diet quality and alcohol consumption.

3.2.2. Outcome evaluation: participants' and counselors perceptions on the effectiveness of PA integration

The findings show that a wide range of PAs from non-exercise PAs (e.g., walking) to leisure time sports (e.g., basketball), contributed to the programs' effectiveness. No matter the type of PA participants perceived these activities as helpful to their efforts to quit. More frequent and longer support was necessary for some patients, according to comments both from counselors and participants. Tracking PA through pedometers was helpful and motivating, but not for all of the participants. The program provided skills training on how to resist tempting situations, however some participants suggested PAs (e.g., breathing exercises) during tempting situations in social environments were not effective. Counselors' suggestions for future program applications showed that PA promotion was helpful but the promotion of a healthier lifestyle, in general (including e.g., alcohol and healthy eating), might also be helpful for some patients. The addition of some group counseling sessions to the individual ones has been suggested as a potential helpful strategy. Finally, a follow-up period with any kind of communication has been suggested as essential in order to help patients maintain new behaviors.

4. Discussion

Both quantitative and qualitative results were encouraging. The participants of the program significantly decreased the number of cigarettes they smoked by the end of the intervention. Additionally, they increased their self-efficacy to abstain from smoking and decreased their smoking habit

Table 3
Emerging themes and quotes.

Emerging themes	Quotes and summarised information
How increased PA worked in the smoking cessation program?	
Improved health	"I feel more alive, I do not get exhausted that easy now" (PC)
Manage feelings of stress and tension	"Walking helped me to reduce my tension" (PC)
Exercise and smoking as contradictory behaviors	"The more you exercise the less you want to smoke, because you feel that you do something beneficial for yourself and you do not want to spoil it by smoking" (PC)
Benefits of having a first-hand experience on your own body	"When you increase your physical activity you have the chance to immediately see the damage that smoking cause to your health and makes you realise your poor physical condition because of smoking" (PC)
Before and after exercise	"Before my scheduled time for exercise, I did not want to smoke because I knew that this would affect my performance…" (PC) "After the exercise sessions I didn't need to smoke for 2−3 h, and day after day this time period (of no need to smoke) was longer and longer" (PC)
Links with other modifiable health-related behaviors	"Besides physical activity now I am also careful with my diet quality and my alcohol consumption, I see it as a new start" (PC)
Developing a new identity	"I see myself as a non-smoker and physically active" (PC)
Willpower	"The three key elements to succeed in this effort are physical activity, willpower and psychological support" (PC)
Effectiveness of PA promotion as a cessation-aid technique	
Type of physical activity	"Physical activity promotion helped them a lot to quit or decrease smoking, although the reported type, frequency and intensity of the activities varied a lot between the participants" (PC) "Reported activities were: brisk walking, jogging, cycling, soccer, basketball, stairs instead of elevator, and walking/biking to work instead of using the car or bus" (CD)
Duration and frequency	"Some participants, mostly those who did not succeed to quit smoking, wanted longer period of intervention whereas others suggested having two meetings per week instead of one" (CD)
Monitoring PA	"Maybe without the pedometer I wouldn't have achieved my goal, as I was curious to find out if I could achieve my goal" "Some participants tend to forget it or it was not convenient for them to wear it for such a long period" (CD)
Contents of the program	"Additional resistance tips or skills on how to resist on social events with other smokers" (CD) "More guidelines on how to adopt a healthier lifestyle in general including other health related behaviours according to the participants needs (e.g., alcohol, diet)" (CD) "Include group counselling meetings" (CD)
Follow-up support	Mobile phone short messaging service motivational messages and face to face contact (CD)

Abbreviations: PC = patients' comments; CD = counselors' diary; PA = physical activity.

scores compared to their initial scores before they enrolled in the program. Increased confidence in one's ability to abstain from smoking is considered both a predictor and possible determinant of smoking cessation.[29]

Qualitative information indicated that, in general, patients perceived PA as a valuable additional cessation aid to the counseling program. Regarding the increase of PA, results indicate that participants who increased their PA had better quit smoking rates after 1 year. This trend is in line with previous findings[8,30] suggesting that smoking cessation rates are higher among those who are more physically active. According to what participants stated, PA was used as a way to control their stress and anxiety and as a means to deal with the fear of weight gain associated with smoking cessation. Both of these benefits of PA during smoking cessation programs have been extensively reported by other researchers.[11,31] According to Landers,[32] PA helps deal with stress and can thus satisfy the motives of those who say that they smoke to control feelings of anxiety. Additionally, people who are physically active report fewer symptoms of depression,[33] so PA can possibly act as a substitute for smokers who use cigarettes in order to cope with feelings of depression.

PA as a cessation aid was also seen as part of a holistic lifestyle change. Participants of the present study found PA as a way to improve their life by adopting a healthier lifestyle. Similar results have been found by the qualitative study of Everson-Hock et al.[11] that identified the lifestyle change as one of the "benefits" related to implementing PA into smoking cessation practice.

Another interesting finding is that PA was considered beneficial to some participants, as a mechanism of attention distraction, in order to avoid relapse. Even participants who did not manage to quit smoking and did not follow the PAs of the program managed to make some changes to everyday PAs (e.g., use of bicycle and stairs instead of elevator). According to deRuiter and Faulkner,[31] "Increases in physical activity, even in the absence of successful smoking cessation, should be seen as a positive outcome in cessation interventions".

There were participants, new to PA, who realised their poor physical condition and how this can be changed by decreasing or quitting smoking. In addition, participants became aware of their physical capability as they increased their PA, in a relatively short time. Nevertheless, the aim of the PA promotion was not necessarily the fitness improvement, but the willingness to

continue PA.[15] Counseling techniques and goal setting also helped participants in organising their everyday life activities and directed them to participate in PA as a technique to deal with the desire for smoking and stress, as they reported. According to the literature, exercise participation during the period of tobacco withdrawal also helps patients deal with sleeping problems,[34] concentration,[35] and depression.[36]

Most of the participants imagine their future selves as non-smokers and physically active. This implies that the program helped them to start building a new, healthier identity. According to several researchers, becoming more physically active may serve as a ''gatekeeping'' function, increasing the likelihood of subsequent smoking cessation attempts.[8,31] This function seems to be apparent to the present participants through their statements on how they think and feel immediately before and after their exercise sessions.

Regarding the kind of PA that was more helpful for them in their effort to quit during the program, the majority of the participants mentioned jogging as the most convenient way. However a rich variety of other activities were also mentioned reflecting the need for a program to allow participants to choose what is most convenient for them.

Monitoring PA through pedometers was not very popular. There were some participants who found it useful but most of them did not find it convenient, because they had to use it for 10 weeks. Those who perceived the pedometer as useful reported that it provided feedback and helped them set goals for increasing their PA levels and kept them motivated. In future applications of the intervention, it might be more helpful to give participants a choice to use the pedometer either on the first and last week of the intervention or during all 10 weeks.

Additionally, to further improve the program participants were suggested using short message service motivational messages for follow-up support. Counselors suggested using group activities during meetings and during the PAs provided by the program. Finally, some participants requested that additional resistance tips or skills be included in the program, for example on how to resist on a social interaction with other smokers. This suggestion implies that the program needs to make some improvements in skills training also. The integration of communication technology applications may be one way to further improve this component of the program.

The main limitation of the current study is the lack of a control group to test if the integration of PA promotion into the counseling program made it more effective. Additionally, the present study relies on self-reports (higher risk of bias) which is a concern for the internal validity. Nevertheless, the information gained from this program application is considered valuable for further applications in the future with a control trial method. Another limitation of the current study is that only the smoking behavior and not the PA adherence has been tracked through the follow-up measures. Future longitudinal studies, with both quantitative and qualitative data collection, following both of the patients' behavioral patterns, will provide us with a deeper understanding on the underlying mechanisms of this behavior change procedure. Further research is needed to enhance our knowledge and practice of the promotion of PA as an additional aid to quitting smoking. Multidisciplinary approaches in research could give valuable information to improve practice for example, integrating strategies from different disciplines such as health behavior, social behavior, and behavioral economics.

5. Conclusion

In conclusion, the evaluation of the "No more smoking! It's time for physical activity" program showed encouraging results. The smoking cessation counseling program with integration of PA promotion had both short and long-term positive results on the participants' efforts to quit smoking. Quantitative data showed that the program boosted the participants' confidence to abstain from smoking in a variety of different situations and decreased their smoking habit and behavior. Additionally, qualitative data yielded valuable information related to the experiences of participants and how they experience the integration of PA as a cessation aid. People who try to quit smoking can become more physically active through targeted intervention. At the same time smokers, themselves, regard PA as a significant aid in their efforts to quit smoking.

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