



Promoting pre-quit physical activity to reduce cue reactivity among low-income sedentary smokers: A randomized proof of concept study ^{☆,☆☆}

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ABSTRACT

Background: Smoking and lack of physical activity (PA) contribute to disproportionate rates of disease among low-income adults. Interventions that simultaneously address both risk behaviors have strong potential to reduce health disparities. Existing smoking-PA studies indicate promising results but have limited generalizability to low-income populations. The goal of this study is to assess the effects of an integrated behavioral counseling approach to promote low-to-moderate intensity PA (LMPA) and reduce short-term smoking cue reactivity among low-income sedentary smokers.

Methods: This study uses a randomized, 2-group design with 4 measurement time points: baseline, quit day (week 4), 1-week and 1-month follow-up. Participants (sedentary, smoke > 6 cigs/day) receive 4 weeks of either (a) standard smoking cessation counseling (SCC control) or (b) our Step-Up to Quit (SUTQ) intervention that integrates advice for LMPA with SCC. SUTQ counseling focuses on increasing daily steps (walking) to reach 7500–10,000/day by week 4 (quit day) and explicitly links short bouts of LMPA with smoking urge management. Potential for SUTQ to facilitate urge management will be assessed by comparing between-group differences in the reduction (extinction) of quit day cue reactivity. We will explore group differences in quit rates at 1-week and 1-month follow-up.

Discussion: This novel approach overcomes gaps in the PA-smoking intervention literature by promoting a more realistic PA approach for sedentary populations, using an ecologically valid strategy, integrating LMPA with evidence-based SCC during a 4-week pre-quit period, and testing the SUTQ counseling model in a high-risk sample. Results will guide future efficacy and dissemination studies.

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1. Introduction

Low-income populations have higher smoking rates [1,2] than the general population and suffer greater tobacco-related morbidity and mortality [1,3] due to limited access to health care [4] and poor quality care [5] which contributes to smoking-related health disparities [6–11]. Most smokers are motivated to quit; [12,13] but low-income smokers have greater difficulty quitting than the general population [12,14] due to added

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barriers such as increased stressors [15], inadequate coping skills [16,17], and treatment access challenges [18]. Smoking cessation interventions using a combination of behavioral counseling and pharmacotherapy (e.g., nicotine patch, Varenicline), represent state-of-the-art treatment [19]. However, uptake of pharmacotherapy is low and standard care advice/self-help materials are not adequately tailored or intensive for underserved populations [20–22]. Thus, there is a need for developing novel behavioral interventions to improve cessation outcomes for this high-risk group.

Emerging evidence points to physical activity (PA) as a promising strategy for smoking behavior change. A recent systematic review showed short-term effects of PA (acute bout of a single session) in reducing smoking urges, withdrawal, and negative affect among smokers with overnight abstinence [23–25]. Other studies show evidence supporting PA for long-term smoking cessation abstinence. (e.g., [26]). However methodological issues (e.g., variability in PA duration, intensity, timing in relation to quitting, and low adherence to PA programs) [25] have limited the ability to effectively program PA interventions for long term abstinence. More research is needed to understand how to better integrate PA into smoking cessation programs [25]. Moreover, most PA-smoking interventions to date have targeted broad populations of smokers, [26–29] thus limiting the generalizability of findings to low-income smokers. Many PA interventions prescribe moderate-to-vigorous intensity exercise; most low-income populations are sedentary [30,31], and vigorous-intensity PA protocols are challenging to adopt and maintain [32–34]. Interventions promoting lower intensity PA protocols (e.g., walking) to underserved, treatment-seeking smokers may be a more feasible approach [35].

Additionally, previous interventions have included supervised/on-site PA sessions which has acceptable adherence rates during intervention but demonstrate low maintenance post-treatment when emphasis shifts to being home-based [25,36]. PA uptake and maintenance among smokers could improve if PA promotion is blended within the context of smoking behavior change. For example, PA is an ideal strategy for building broader skills and self-efficacy in managing urges, withdrawal, and mood [37,38] during a pre-quit period – before initiating a quit attempt. Encouraging smokers to use PA to manage daily smoking urges, when they occur, could create valuable opportunities for smokers to experience and optimize its utility during this preparatory period [39] and before the enormous challenges of quitting smoking.

The current study is designed to overcome these limitations within smoking-PA literature by (a) engaging treatment-seeking sedentary smokers in a realistic, low-to-moderate PA regimen by promoting increased daily steps, (b) linking short bouts of PA with urge management training, and (c) integrating PA promotion messaging and support with evidence-based smoking cessation counseling. The counseling intervention in this study uses an ecologically valid approach that explicitly ties PA to urge coping within the content valid framework of smoking cessation training; providing smokers an opportunity to experience PA's urge attenuating properties prior to quitting and increases confidence in PA for smoking behavior change. Moreover, adopting and increasing daily PA may serve as a 'gateway behavior' for smoking cessation (and relapse prevention) through changes in important factors

(e.g., self-efficacy) known to facilitate health behavior change [40,41].

2. Methods

2.1. Study design and overview

This study uses a randomized, two-group design (experimental vs. control) with four assessment points: baseline (week 0), quit day (week 4), one week (week 5), and one-month (week 8) follow-up. Eligible participants are randomized to receive (a) Step-Up to Quit (SUTQ) counseling intervention that integrates low to moderate intensity PA (LMPA) integrated with proactive, telebased smoking cessation counseling, or (b) standard care smoking cessation counseling intervention (SCC). The 4-week intervention includes two in-office counseling sessions and three telephone sessions. On their quit day session (week 4), participants attend an in-person behavioral lab session to complete 5 massed smoking cue-reactivity trials following carbon monoxide verification of abstinence and quit day session questionnaires. Follow-up assessments occur at one-week (week 5) and one-month (week 8) post-quit day session. The study is approved by the institutional review board (Temple University IRB protocol # 21109).

2.2. Study aims

This study has two primary outcomes; PA adoption and quit day smoking cue reactivity. Specifically, we hypothesize that individuals in the SUTQ group will have greater PA adoption and greater reduction in quit day smoking cue reactivity compared to the control group. We will explore a secondary outcome of group differences in short-term quit rates at 1 week, and at 1 month post quit-day follow-up. Additionally, we will examine mediating effects of PA on cue reactivity and smoking outcomes. Finally, given extant research linking negative affect [42], weight concerns [43] and urge coping [44,45] to smoking outcomes, we will explore these variables for potential mediation with smoking reactivity and outcomes.

2.3. Participants

Participants include 84 treatment-seeking sedentary male and female smokers between 18–59 years of age, from low-income largely African American communities recruited using flyers posted at community clinics (e.g. WIC), health centers and sites across the city (e.g. convenient stores, grocery store) and health clinics within the university system. Respondents to study ads call the project phone line and research staff assess study eligibility. Study inclusion criteria include smoking >6 cigarettes per day: a cut-off commonly used in smoking studies enrolling African Americans [46] as they tend to be lighter smokers (<10 cigarettes per day) than the general population [47] with reported intention to quit smoking within the following 6 months. Sedentary behavior is obtained via self-report and defined as: less than 20 minutes of purposeful vigorous intensity PA or less than 60 minutes of purposeful moderate intensity, or walking for less than 100 minutes per week on the modified version of the International Physical

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