Advancing the Development of a Genetically-Informed Smoking Cessation Intervention

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Genetic variation in nicotinic receptor subunits explains differences in smoking behaviors and risk of smoking-related diseases (Bierut, 2019). Personalized genetic risk results specific to smoking may motivate smoking cessation treatment, yet such behavioral interventions have not been developed or tested. In a series of studies, we leveraged the NIH Stage Model of Behavioral Intervention Development to iteratively design a genetically-informed behavioral intervention (‘*RiskProfile’*) and test its acceptability and associated behavior change among current smokers.

Methods: We first developed an algorithm that integrates genetic (*CHRNA5* variants) and phenotypic (smoking heaviness) factors to estimate one’s risk for lung diseases and difficulty quitting smoking. To optimize risk communication, we designed an initial version of the *RiskProfile* and, in two prototype studies, conducted brief participatory design interviews (n=110) followed by quantitative surveys (n=100) with potential end-users to inform iterative design changes and ultimately confirm the acceptability of the refined *RiskProfile*. Next, current smokers (n=108) were enrolled in a proof-of-concept intervention trial with three study visits. Participants completed genetic testing (V1), received their *RiskProfile* at Week 6, which included personalized risks of smoking-related diseases and evidence-based recommendations to promote cessation (V2), and completed a follow-up assessment of smoking outcomes at Week 10 (V3).

Results: Of enrolled current smokers, 83% were retained across the three visits. Additionally, 83% of participants found *RiskProfile* to be highly acceptable, and 89% demonstrated accurate recall of key *RiskProfile* messages. At post-intervention, 37% of current smokers reported increased desire to use smoking cessation medications, and 21% reported initiating use of cessation pharmacotherapy (i.e., prescription medications or over-the-counter aids such as nicotine patch or gum). Additionally, cigarettes smoked per day appeared to decrease from receipt of *RiskProfile* (11.3) to 30-day follow-up (9.8). Notably, 69% of participants reported increased readiness to quit after receiving *RiskProfile*, and two-thirds reported reducing their cigarette smoking. Of note, 77% reported at least one behavior change related to their smoking (e.g., made a quit attempt, cut down on cigarettes, tried FDA-approved cessation medication).

Discussion: This study is significant as it introduces genomics into a highly personalized behavioral intervention to promote underutilized cessation treatments. Participatory design with end-users yielded a highly acceptable genetically-informed behavioral intervention that demonstrated great promise for driving progress toward smoking cessation. Importantly, this personalized genetic risk communication tool was associated with both increased treatment use and reduced smoking. As the science of genetic biomarkers for smoking continues to develop, we must also develop the tools to communicate this science to individuals who stand to benefit. This study reflects an innovative application of genetic risk feedback to personalize risk communication and motivate engagement in evidence-based treatment for current smokers.

References: Bierut L.J. *Curr Epidemiol Rep* 6:486–490 (2019).

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