

Digitized Hypocrisy Induction Towards Smoking Cessation: Development and Evaluation in a Controlled Trial

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ABSTRACT

Given the healthcare and economic consequences due to smoking, we draw from Cognitive Dissonance Theory to investigate how the deployment of a mHealth intervention based on hypocrisy induction may affect smoking cessation outcomes. It introduces and operationalizes Digitized Hypocrisy Induction (DHI) as a two-step procedure: a) Asking participants to advocate a pro-health position, and b) using technology-based features to remind them of their 'transgressions' in failure. Our research hypothesizes how individuals exposed to DHI change in their smoking behavior via induction of negative affective states, compared to those not exposed. To test these hypotheses, we developed a mHealth intervention named HappyLungs based on the principles of DHI. For the next step, we will deploy and assess the intervention in a smoking clinic via a randomized controlled trial.

Keywords: Cognitive dissonance, hypocrisy induction, mHealth intervention, smoking cessation.

INTRODUCTION

Smoking is a leading preventable cause of death (Centers for Disease Control Prevention 2011), and is associated with many diseases including various cancers, chronic obstructive pulmonary disease, coronary heart disease, stroke, and other diseases (Fagerström, 2002). Estimates of the economic costs due to smoking stand at 1.8% of the world's annual GDP (Goodchild *et al.*, 2018). Although medical experts advocate for both pharmacotherapy and traditional behavioral support to be the first line of treatment for smoking cessation, long waiting times often dampen the appeal of these options for smokers (Adams & Hudmon, 2018). In response, the use of emerging technology-based interventions offer several advantages over these traditional means: lowered delivery costs, increased reach, and greater scope for customization (Murray *et al.*, 2016). In turn, these may lead to improved effectiveness, efficiency, and safety for quitting smokers.

Despite evidence showing that using these interventions is related to improved smoking cessation rates (Whittaker *et al.*, 2019), an ongoing problem concerns their association with abstinence or quit rate; prior meta-analyses found either small or inconsistent associations (Aveyard *et al.*, 2012; Regmi *et al.*, 2017). While prior research has established intention as a proximal determinant of behavior change, this intention-behavior connection does not consistently hold in the context of smoking cessation. For example, Moan found in a 2005 review of 20 smoking-related studies that intention as a determinant does not predict smoking cessation behavior as strongly as compared to other predictors like perceived behavior change (Moan, 2005). Previous studies attribute this gap to individuals who failed in their intention to engage in behavior change (Sheeran, 2002). A clear understanding of this gap is important because a habitual smoker is more likely to perceive a change in smoking behavior differently from other health behaviors. Resistance to change, which can be attributed to the addictive nature of smoking, may cause the individual to develop alternate views that downplay the harmful effects of smoking (e.g. The risk from smoking is negligible compared to death from traffic accidents) (Harmon-Jones & Mills, 2019).

To address this research gap, we draw on the cognitive dissonance literature as a theoretical lens as a candidate explanation for the association between use of technology-based interventions and cessation rates. Early theorizations proposed that cognitive dissonance is a psychologically uncomfortable state that individuals are motivated to reduce by modifying their behavior or attitude (Festinger, 1962). It is also a negatively affective reaction to an aversive event (Stalder & Anderson, 2014); prior research proposes that depressed people are expected to be more susceptible to its effects since they experience more negative affect than nondepressed people, and are thus more likely to take measures in alleviating both dissonance and negative behaviors associated with their depressive conditions (Beck & Alford, 2009). Indeed, a meta-review (Freijy & Kothe, 2013) of cognitive dissonance interventions found evidence in terms of increased adoption of protective behavior and lowering of risky behavior. Of the various means available to induce cognitive dissonance, the hypocrisy induction (HI) paradigm is the most widely used (Freijy & Kothe,

2013). This is typically operationalized as a two-step procedure in which individuals first publicly advocate a socially desirable behavior and then later reflect on their failures to conform to this behavior (Stone *et al.*, 1994). A HI-based perspective, based on aligning the stages of HI with the development of technology-based features, thus fits well with our investigation of cognitive dissonance as a strategy facilitated by technology towards smoking cessation. Accordingly, we introduce an experimental procedure in a field experiment to evaluate the efficacy of this strategy.

The paper is structured as follows: Section 2 introduces the theoretical background on cognitive dissonance in smokers and proposes potential hypotheses. Section 3 outlines the proposed methodology. Section 4 discusses the potential implications and next steps.

THEORETICAL BACKGROUND AND DEVELOPMENT

Smoking and Cognitive Dissonance Theory

Cognitive dissonance theory, or CDT, posits that a state of psychological discomfort or tension is created when an individual perceives their behavior as inconsistent with their current beliefs (Festinger, 1962). This state of psychological discomfort, or 'dissonance', motivates them to reduce it. When behavior change is difficult, a change in belief or attitude is more likely to occur. Prior dissonance research identified paradigms that rationalized how individuals would respond to dissonance (Harmon-Jones & Mills, 2019); one such paradigm is the 'hypocrisy' paradigm, or making individuals aware that they are not practicing what they should be practicing (Aronson *et al.*, 1991; Kim & Ryoo, 2022). The paradigm argues that when the individual first makes a statement about the value of the behavior and is then reminded of their past failures in this regard, the resulting inconsistencies between their current beliefs and past acts induce cognitive dissonance. The psychological technique to motivate them to align future behavior with accepted norms via this paradigm is thus defined in past studies as 'Hypocrisy Induction' (HI) (Kim & Ryoo, 2022).

Given the inherent difficulty involved in quitting smoking (Centers for Disease Control Prevention 2011), CDT is more likely to posit that smokers will reduce dissonance by changing their smoking-related beliefs instead of their behavior (Chapman *et al.*, 1993; Fotuhi *et al.*, 2013). Indeed, the US CDC (Centers for Disease Control Prevention 2011) found that although 7 in 10 smokers would like to quit smoking, only 6.2% of them succeeded.

Prior research found that the change in belief amongst smokers manifests in the form of generating and endorsing pro-smoking beliefs (Fotuhi *et al.*, 2013). These beliefs either emphasize the benefits of smoking (stress reduction, pleasure) or minimize the personal relevance of the consequences of smoking (Hajek *et al.*, 2010; McEwen *et al.*, 2008). While generating or endorsing the beliefs was previously found to be associated with promoting mental health (Taylor & Brown, 1988), smokers were consequently found to reduce their psychological need to change their behavior and subsequent smoking activities (Borland *et al.*, 2009).

Prior studies have argued that while dissonance reduction has been used as a reason for changes in smoking behavior, only a few of them examined dissonance-reducing motivation and its change over time as a factor (Fotuhi *et al.*, 2013). Borland and colleagues (2009) found that risk-minimizing and self-exempting beliefs were negatively associated with both intentions to quit in the same wave and making a quit attempt in the next wave. In a separate study, Fotuhi and colleagues (2013) found a rebound in functional beliefs in smoking among ex-smokers who made a quit attempt but later failed.

Digitized Hypocrisy Induction and its Effect on Smoking Cessation

Recent advancements in information and communication technologies are providing new modes for interventions by either supplementing or enabling new interventions. These technologies can be considered as a constellation of building blocks or 'features' (Griffith, 1999), each of them capable of enabling unique use cases that differ in scale and interactivity from their traditional, in-person counterparts. To build the hypotheses that explain how the employment of these features can facilitate cognitive dissonance via HI, we introduce the concept of Digitized Hypocrisy Induction (DHI). We define DHI as the dissonance-inducing process of employing technology-based features to facilitate public advocacy for a desired behavior before reminding past failures to engage in the behavior.

Our principal theoretical argument is that as individuals interact with technology-based interventions, they will be more likely to induce DHI towards influencing their behavior via negative emotional affective states. The emergence of sophisticated technology-based systems is driving more immersive human-computer interactions capable of influencing emotions and thought processes. Users can perceive such systems as an alternate sentinel agent capable of interaction (Nass & Moon, 2000) aside from their traditional, pedagogical counterparts. For instance, a chatbot can be programmed by Artificial Intelligence to emulate social skills such as active listening and natural responses, fostering a sense of connection (Gratch *et al.*, 2007). This enables technology features to be potentially capable of appraising human behavior and prompting them to activate feelings associated with morality and ethical decision-making (Kim & Ryoo, 2022; Tracy & Robins, 2006).

An alternate influence of DHI involves the potential for scale. People tend to be under pressure to uphold a reputation for cooperation and avoid the social consequences of engaging in norm-deviant behavior when they perceive a social presence (Posner and Rasmusen, 1999). Negative affect caused by the moral failure, such as guilt and shame (Thompson, 2007), may be magnified when there is increased potential for observability (Kothgassner *et al.*, 2017) and the other person's relevance in the

engagement is amplified (Short *et al.*, 1976). Technology-based features have the potential to remotely amplify the presence of others at scale, such that the others can more easily observe their dependents' actions without needing to be in their vicinity. For instance, mobile app-based dashboards and virtual pledging can empower them to observe the actions of their dependents and intervene remotely with targeted reminders to the dependents for follow-up actions. Thus, we hypothesize:

H1: Smokers who are exposed to Digitalized Hypocrisy Induction (DHI) will be more likely to experience negative affect as opposed to those who are not exposed.

Prior studies in public health interventions have investigated the use of negative affect to invoke targeted responses towards varied outcomes. The experience of negative affective states may nudge transgressors to reflect on who they are or what they did, evoking emotive self-responses towards responsibility for non-compliance (Tangney *et al.*, 2007). Prior studies found that individual responses to non-compliance depends on their self-esteem. Those with high self-esteem are likely to have a positive self-image and are primarily driven to showcase their skills; conversely those with low self-esteem have a negative self-image and are more likely to avoid making mistakes (Heimpel *et al.*, 2006). Smokers with high self-esteem typically experience more dissonance and thus are more likely to report an intention to quit smoking, whereas the inverse effects also apply for smokers with low self-esteem (Peterson *et al.*, 2008). The current literature thus offers conflicting predictions on the link between negative affect and smoking behavior. We highlight these predictions in the following set of hypotheses:

H2a: Smokers who experienced negative affect from DHI will be more likely to smoke fewer cigarettes as opposed to those who are not exposed.

H2b: Smokers who experienced negative affect from DHI will be more likely to smoke more cigarettes as opposed to those who are not exposed.

METHODOLOGY

Study Design

To test the hypotheses, we will deploy a lab-built mHealth intervention, titled HappyLungs, in a longitudinal randomized controlled trial involving a control arm and an intervention arm. Participants will be randomly assigned to both arms with Systematic Sampling (Madow & Madow, 1944). While participants in both arms will use the mHealth intervention, individuals assigned to the treatment arm will be exposed to app features that facilitate DHI while those in the control arm will not be exposed. The study will last for 28 days; past research found this duration to be related to increased abstinence (West & Stapleton, 2008).

Participants

60 participants will be recruited from a local smoking clinic situated in Asia on a rolling basis. They will be adults aged 18-65 who have smoked at least five cigarettes daily for at least two years. Those found to be exposed regularly to second-hand or environmental smoke will be excluded to rule out confounding factors. Everyone who consented to participate will receive a carbon monoxide (CO) monitor device, named Smokerlyzer, that non-invasively measures the amount of CO on a smoker's breath. They will also be prompted to install HappyLungs on their mobile devices. Once onboarded via a series of in-app questionnaires, participants will be instructed to use HappyLungs and their Smokerlyzer for 28 consecutive days, after which they will be reimbursed with shopping vouchers for completing the study.

The HappyLungs Intervention

DHI will be operationalized in the HappyLungs mHealth platform. Developed in a local research lab, HappyLungs is designed to facilitate smoking cessation using multiple features including (Table 1): i) remote onboarding; ii) a chatbot capable of answering smoking-related questions; iii) automatic recording of CO via Smokerlyzer; iv) Journal, and v) Reminder-based notifications. In addition, it has two additional features that facilitate DHI: vi) a virtual pledge to quit smoking that will appear once when they onboard via the app, vii) Nominating close ones to review a smoker's smoking cessation journal, and viii) an alternate chatbot attempting to induce hypocrisy by deliberately asking three short questions on how and why they smoke weekly. These additional features will only be available to smokers who have been assigned to be exposed to DHI (i.e. treatment).

Table 1: HappyLungs Features

Home Page	Pledge from Smokers to Quit Smoking	Chatbot (with Hypocrisy Mode)	Nominee View (with a review of Smoker's Smoking History)

Source: This study.

Operationalization and Proposed Analyses

As the dependent variable, smoking behavior will be collected as two variables. First, CO Levels in the form of ppm and %COHb will be collected from Smokerlyzer devices used by the participants and logged into HappyLungs. Weekly average CO levels will be analyzed at the individual-weekly level. Second, the seven-day average number of cigarettes smoked will be reported by the user via HappyLungs as a self-reported smoking log. The independent variables used will include smoking beliefs (using scales adapted from Fotuhi *et al.* (2013)), and negative affect (using the PANAS-SF questionnaire by Thompson (2007)); they will be collected via questionnaire administered to the participants before and after the study (Thompson, 2007). Control variables will be collected at the baseline via HappyLungs, covering demographic variables like age and gender. Kruskal-Wallis One-Way ANOVA will be used to assess differences between the two arms for the dependent and independent variables. An objective manipulation check will also be applied to assess if the DHI features are used by the users; specifically, we will collect data on the number of responses sent to the hypocrisy chatbot per week and a remote check to assess if the user had signed the pledge in HappyLungs.

DISCUSSION

Theoretical Implications

Our study seeks to make several theoretical contributions. First, it aims to advance the cognitive dissonance literature by illustrating how technology-based features may amplify the dissonance effect traditionally associated with HI. By introducing and operationalizing DHI, we build on previous studies by assessing how exposure to technology-based interventions may influence the way HI manifests in individuals, compared to those who are not exposed. Individuals exposed to DHI are more readily exposed to the cues signalling HI due to their interactions with technology-based features that are potentially more vivid, accessible, and relevant.

Further, our study seeks to evaluate how exposure to DHI may be associated with responses related to smoking cessation (McVay *et al.*, 2019). In the smoking cessation literature, prior studies compared the change in smoking beliefs at one point in time to predict smoking cessation outcomes in a future period (Borland *et al.*, 2009; Fotuhi *et al.*, 2013). However, the extent to which these effects manifest may vary depending on the depth of interactions an individual may have with the features designed to facilitate DHI. This study addresses this gap by illustrating how the use of these features over time may influence the formation of beliefs related to dissonance and subsequent smoking behavior.

Our research also contributes to the health technology literature by offering an alternate explanation for the way users respond after using features of technology-based interventions for behavior change. Prior research observed that the observed behavior change following use of technology-based interventions are preceded by positive affect such as motivation (Bice *et al.*, 2016). In contrast, our research suggests that behavior change may also occur due to users assuming responsibility for an unwanted outcome via negative affect arising from hypocrisy induction. This suggests that a technology-based feature typically deployed with the intent to promote positive affective responses may also have the potential to instead induce feelings of dissonance; it

will thus be important to consider how the use of the feature will lead to intended behavior outcomes via the affective responses experienced by the user.

Practical Implications

This research has several practical applications. First, this study introduces a means to remotely deliver hypocrisy induction as an intervention towards smoking cessation. Previous studies (Hafstad *et al.*, 1997; Peterson *et al.*, 2008) on cognitive-dissonance interventions induced hypocrisy via in-person interactions, limiting their potential scalability and cost-effectiveness. Our study addresses these limitations by remotely facilitating DHI through a mHealth intervention based on prior research. Second, our research can benefit designers who seek to operationalize DHI in health-related mHealth applications. HappyLungs, as a proof of concept, demonstrates multiple features that are designed as means to enforce DHI: i) the introduction of a virtual pledge; ii) the nomination of close ones to view individual Smokerlyzer scores and logs, and iii) prompted chat by the chatbot to ask smokers on their progress.

CONCLUSION AND NEXT STEPS

While technology-based interventions can revolutionize the way clinicians and researchers monitor and manage the health of smoking patients, the heterogeneity in smoking cessation content may mean that not all applications can effectively engage users or trigger behavior change. Our study addresses this challenge by theorizing, designing, and testing a theoretically grounded intervention platform for smoking cessation. Drawing from theories in the cognitive dissonance and emotional affect literature, we propose and test DHI as an efficacious intervention mechanism to facilitate smoking cessation.

Multiple initiatives are planned to advance the current work. First, HappyLungs will be deployed in the controlled trial to assess its efficacy. Behavior responses from the trial, including Smokerlyzer scores and smoking logs, will be used to assess the efficacy of HappyLungs in facilitating HI. Second, the model will consider the effects of individual differences on intention towards smoking cessation. Third, we plan to deploy the features based on DHI in other mHealth intervention projects to assess its generalizability and robustness in other health-based domains.

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REFERENCES

- Adams, A. J., & Hudmon, K. S. (2018). Pharmacist prescriptive authority for smoking cessation medications in the united states. *Journal of the American Pharmacists Association*, 58(3), 253-257.
- Aronson, E., Fried, C., & Stone, J. (1991). Overcoming denial and increasing the intention to use condoms through the induction of hypocrisy. *American Journal of Public Health*, 81(12), 1636-1638.
- Aveyard, P., Madan, J., Chen, Y., Wang, D., Yahaya, I., Munafò, M., Bauld, L., & Welton, N. (2012). Effectiveness and cost-effectiveness of computer and other electronic aids for smoking cessation: A systematic review and network meta-analysis. *Health Technology Assessment*, 16(38).
- Beck, A. T., & Alford, B. A. (2009). *Depression: Causes and Treatment*. University of Pennsylvania Press.
- Bice, M. R., Ball, J. W., & McClaran, S. (2016). Technology and physical activity motivation. *International Journal of Sport and Exercise Psychology*, 14(4), 295-304.
- Borland, R., Yong, H.-H., Balmford, J., Fong, G. T., Zanna, M. P., & Hastings, G. (2009). Do risk-minimizing beliefs about smoking inhibit quitting? Findings from the international tobacco control (itc) four-country survey. *Preventive Medicine*, 49(2-3), 219-223.
- Centers for Disease Control Prevention. (2011). Quitting smoking among adults--united states, 2001-2010. *MMWR. Morbidity and Mortality Weekly Report*, 60(44), 1513-1519.
- Chapman, S., Wong, W. L., & Smith, W. (1993). Self-exempting beliefs about smoking and health: Differences between smokers and ex-smokers. *American Journal of Public Health*, 83(2), 215-219.
- Fagerström, K. (2002). The epidemiology of smoking: Health consequences and benefits of cessation. *Drugs*, 62, 1-9.
- Festinger, L. (1962). Cognitive dissonance. *Scientific American*, 207(4), 93-106.
- Fotuhi, O., Fong, G. T., Zanna, M. P., Borland, R., Yong, H.-H., & Cummings, K. M. (2013). Patterns of cognitive dissonance-reducing beliefs among smokers: A longitudinal analysis from the international tobacco control (itc) four country survey. *Tobacco Control*, 22(1), 52-58.
- Freijy, T., & Kothe, E. J. (2013). Dissonance-based interventions for health behaviour change: A systematic review. *British Journal of Health Psychology*, 18(2), 310-337.
- Goodchild, M., Nargis, N., & d'Espaignet, E. T. (2018). Global economic cost of smoking-attributable diseases. *Tobacco Control*, 27(1), 58-64.
- Gratch, J., Wang, N., Gerten, J., Fast, E., & Duffy, R. (2007, September 17-19, 2007). Creating rapport with virtual agents. In *Intelligent Virtual Agents: 7th International Conference, IVA 2007 Proceedings, Paris, France*.
- Griffith, T. L. (1999). Technology features as triggers for sensemaking. *Academy of Management Review*, 24(3), 472-488.
- Hafstad, A., Aarø, L., Engeland, A., Andersen, A., Langmark, F., & Stray-Pedersen, B. (1997). Provocative appeals in anti-smoking mass media campaigns targeting adolescents—The accumulated effect of multiple exposures. *Health Education Research*, 12(2), 227-236.

- Hajek, P., Taylor, T., & McRobbie, H. (2010). The effect of stopping smoking on perceived stress levels. *Addiction, 105*(8), 1466-1471.
- Harmon-Jones, E., & Mills, J. (2019). An introduction to cognitive dissonance theory and an overview of current perspectives on the theory. In E. Harmon-Jones (Ed.), *Cognitive Dissonance: Reexamining A Pivotal Theory in Psychology* (pp. 3-24). American Psychological Association.
- Heimpel, S. A., Elliot, A. J., & Wood, J. V. (2006). Basic personality dispositions, self-esteem, and personal goals: An approach-avoidance analysis. *Journal of Personality, 74*(5), 1293-1320.
- Kim, W., & Ryoo, Y. (2022). Hypocrisy induction: Using chatbots to promote COVID-19 social distancing. *Cyberpsychology, Behavior, and Social Networking, 25*(1), 27-36.
- Kothgassner, O. D., Griesinger, M., Kettner, K., Wayan, K., Völkl-Kernstock, S., Hlavacs, H., Beutl, L., & Felnhofer, A. (2017). Real-life prosocial behavior decreases after being socially excluded by avatars, not agents. *Computers in Human Behavior, 70*, 261-269.
- Madow, W. G., & Madow, L. H. (1944). On the theory of systematic sampling, I. *The Annals of Mathematical Statistics, 15*(1), 1-24.
- McEwen, A., West, R., & McRobbie, H. (2008). Motives for smoking and their correlates in clients attending stop smoking treatment services. *Nicotine & Tobacco Research, 10*(5), 843-850.
- McVay, M. A., Bennett, G. G., Steinberg, D., & Voils, C. I. (2019). Dose-response research in digital health interventions: Concepts, considerations, and challenges. *Health Psychology, 38*(12), 1168.
- Moan, I. S. (2005). Smoking or not smoking: How well does the theory of planned behaviour predict intention and behaviour. *Unpublished doctoral dissertation, Department of Psychology, Faculty of Social Sciences, University of Oslo, Norway.*
- Nass, C., & Moon, Y. (2000). Machines and mindlessness: Social responses to computers. *Journal of Social Issues, 56*(1), 81-103.
- Peterson, A. A., Haynes, G. A., & Olson, J. M. (2008). Self-Esteem differences in the effects of hypocrisy induction on behavioral intentions in the health domain. *Journal of Personality, 76*(2), 305-322.
- Posner, R. A., & Rasmusen, E. B. (1999). Creating and enforcing norms, with special reference to sanctions. *International Review of Law and Economics, 19*(3), 369-382.
- Regmi, K., Kassim, N., Ahmad, N., & Tuah, N. A. (2017). Effectiveness of mobile apps for smoking cessation: A review. *Tobacco Prevention & Cessation, 3*.
- Sheeran, P. (2002). Intention-behavior relations: A conceptual and empirical review. *European Review of Social Psychology, 12*(1), 1-36.
- Short, J., Williams, E., & Christie, B. (1976). *The social psychology of telecommunications*. Wiley.
- Stalder, D. R., & Anderson, K. M. (2014). Are depressed individuals more susceptible to cognitive dissonance? *Current Research in Social Psychology, 22*, 10-19.
- Stone, J., Aronson, E., Crain, A. L., Winslow, M. P., & Fried, C. B. (1994). Inducing hypocrisy as a means of encouraging young adults to use condoms. *Personality and Social Psychology Bulletin, 20*(1), 116-128.
- Tangney, J. P., Stuewig, J., & Mashek, D. J. (2007). Moral emotions and moral behavior. *Annual Review of Psychology, 58*, 345-372.
- Taylor, S. E., & Brown, J. D. (1988). Illusion and well-being: A social psychological perspective on mental health. *Psychological Bulletin, 103*(2), 193.
- Thompson, E. R. (2007). Development and validation of an internationally reliable short-form of the positive and negative affect schedule (PANAS). *Journal of Cross-Cultural Psychology, 38*(2), 227-242.
- Tracy, J. L., & Robins, R. W. (2006). Appraisal antecedents of shame and guilt: Support for a theoretical model. *Personality and Social Psychology Bulletin, 32*(10), 1339-1351.
- West, R., & Stapleton, J. (2008). Clinical and public health significance of treatments to aid smoking cessation. *European Respiratory Review, 17*(110), 199-204.
- Whittaker, R., McRobbie, H., Bullen, C., Rodgers, A., Gu, Y., & Dobson, R. (2019). Mobile phone text messaging and app-based interventions for smoking cessation. *Cochrane Database of Systematic Reviews, 10*.