Published in final edited form as:

Subst Use Misuse. 2019 ; 54(7): 1086–1095. doi:10.1080/10826084.2018.1555259.

Addiction Mindsets and psychological processes of quitting smoking

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Abstract

Background: Lay belief systems about the malleability of human attributes have been shown to impact behavior change in multiple domains. Addiction *mindset* — i.e., beliefs about the permanence (vs. malleability) of addiction — may affect cigarette smokers' ability to quit, but this has never been examined.

Objectives: The aims of the present research were to develop a measure of addiction mindset (study 1) and examine its associations with various psychological aspects of quitting smoking (study 2).

Methods: In Study 1, using factor analysis of current smokers' and non-smokers' (n=600) responses to 22 items designed to measure addiction mindset, we developed a reliable six-item *Addiction Mindset Scale* (AMS). In Study 2, adult smokers (n = 200) completed the AMS, and measures of a number of psychological processes related to smoking.

Results: Higher scores on the AMS, indicative of the belief that addiction is malleable (referred to as a growth mindset), were positively and significantly associated with greater motivation to quit, greater commitment to quitting, greater self-efficacy to abstain, less attribution of failure to lack of ability to change addiction, and fewer self-reported barriers to cessation (all p's < .05).

Conclusions: The results of this study show a relationship between the beliefs about the permanence of addiction and psychological processes relevant to quitting smoking. The findings underscore the potential of future research exploring how addiction mindsets relate to successful smoking cessation as well as other types of addictive behavior and how they can be applied to change people's behavior.

Keywords

Addiction; psychology; mindset; cigarette smoking; beliefs

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Conflict of Interests

Dr. Bricker has served as a consultant for GlaxoSmithKline and serves on the advisory board of Chrono Therapeutics. Dr. Heffner has received research support from Pfizer. None of the other authors have financial conflicts to disclose.

Introduction

Cigarette smoking is the leading cause of preventable death and disease in the United States (U.S. Department of Health and Human Services, 2014). Although the majority of smokers desire to quit, only a few are able to achieve sustained abstinence (Hughes, Keely, & Naud, 2004; U.S. Department of Health and Human Services, 2014). Thus, we need new approaches to help people stop using tobacco. One approach involves assessing and intervening on users' beliefs about the nature of addiction. While there is a large body of research on the role of beliefs in behavior change, recent advances in psychology have shown that beliefs about the permanence of personal qualities underlying these behaviors, or *mindset*, have far reaching consequences (Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2012; Dweck, 2012). The purpose of this paper is twofold: (1) to define and develop a measure of mindsets about addiction, and (2) to examine the relationship between addiction mindsets and various psychological processes relevant to quitting smoking.

Fixed vs. Growth Mindsets

People develop lay theories about the nature of human attributes such as intelligence, and personality (Dweck, Chiu, & Hong, 1995). These lay theories, also referred to as fixed and growth mindsets, are belief systems about the permanence vs. malleability of different human attributes. A person holding a fixed mindset about an attribute (e.g. intelligence or addiction) considers that it is a permanent entity that is firmly entrenched in an individual's personality that is virtually unchangeable (Dweck et al., 1995). In contrast, a person holding a growth mindset about that attribute believes that the attribute is malleable, and every person has the capacity to change (Dweck et al., 1995). These belief systems function like knowledge structures, or mental models about how flexible or invariant people's attributes are (Chiu, Hong, & Dweck, 1997; Plaks, Levy, & Dweck, 2009) and people tend to draw more often than not from one of these perspectives when evaluating their own behavior and the world around them (Dweck et al., 1995).

Holding these differing core assumptions about whether people can impact a variety of psychological processes, which in turn can influence successful behavior change (Blackwell, Trzesniewski, & Dweck, 2007; Burnette et al., 2012; Dweck, 2010). For example, having a growth mindset can help people perceive setbacks as an opportunity to adopt mastery strategies, i.e., acquire and practice new skills needed to achieve their goal (Burnette et al., 2012; Dweck et al., 1995). Mindset has also been shown to be associated with different expectations about whether effort will lead to successful behavior change (Burnette, O'Boyle, et al., 2012). People with a growth mindset tend to believe that putting in effort will lead to success (positive effort expectations), which translates to greater success (Burnette et al., 2012). In contrast, people with a fixed mindset do not tend to have positive effort expectations because they believe their abilities are fixed. They are unlikely to try again because they believe that it will only confirm that they do not have what it takes to succeed, and therefore are more likely to react with helplessness and avoidant coping strategies (Dweck, 1999). In this way, mindset has a powerful impact on a person's persistence when facing difficulties. Indeed it functions to bolster a type of psychological resilience in stressful situations (Burnette et al., 2012; Schroder et al., 2017).

Research has shown that endorsement of fixed vs. growth mindsets are domain-specific – for example, a person who has a fixed mindset of intelligence does not necessarily have a fixed mindset about personality, athletic ability, or other attributes (Dweck et al., 1995; Schroder, Dawood, Yalch, Donnellan, & Moser, 2016). For this reason, it is important to be able to measure mindsets and explore their relationship with behavior change in specific domains of interest rather than assuming generality from one set of findings. Despite the successful application of this theory to many domains, including social interaction (Beer, 2002), exercise (Biddle, Wang, Chatzisarantis, & Spray, 2003), dieting (Burnette & Finkel, 2012), and mental health (Schroder, Dawood, Yalch, Donnellan, & Moser, 2015), to our knowledge there has been no systematic work applying this to the domain of addiction.

Extending mindset theory to addiction

Adapting from existing definitions (e.g., Dweck et al., 1995), a belief system about the malleability of addiction may be called an *addiction mindset*. A person can either have a *fixed mindset about addiction* whereby they believe that addiction is a permanent attribute of a person and cannot change. Alternately, they can have a *growth mindset about addiction*, whereby they believe that addiction is not permanent. Note that an addiction mindset is not synonymous with self-efficacy and outcome expectancies about quitting in two fundamental ways. First, addiction mindset is not about the malleability of problematic behaviors per se; it is about the malleability of the quality that is believed to underlie the behaviors, just as a mindset about intelligence is about the malleability of “intelligence,” which is believed to underlie scores on intelligence tests and other “intelligent” behaviors. The popular belief that one may stop smoking but, deep down, the addiction may still be there (e.g. “once an addict, always an addict”) illustrates this distinction. Second, an addiction mindset is about the malleability of addiction as experienced by people in general, rather than about one’s own addiction specifically. Thus, it is possible for a person to believe that addiction is generally malleable but her own addiction is not. Mindset is also different from other theories typically used to study health behavior. Specific to health behaviors, the Health Belief model suggests that people’s beliefs about the barriers and benefits of changing their own behavior ultimately determines whether they can successfully change (Rosenstock, 1974). Exploring people’s mindset about addiction may shed some new light on a specific barrier of changing behavior, namely one’s own beliefs about the permanence of human qualities, which is not addressed by the Health Belief Model.

Some existing research suggests that addiction mindset may be a useful conceptual tool for understanding addictive behavior. For example, one study found that the disease model posits that addiction is rooted in the biology of a person, and tends to promote what might be considered a fixed mindset about addiction (Wiens & Walker, 2015). Such belief systems can be considered harmful for recovery by both addiction researchers and recovering patients (Hammer et al., 2013). The overarching aim of the present work is to measure these types of beliefs about the changeability of addiction, and empirically test how these contrasting beliefs are related to a variety of psychological aspects of addictive behavior and recovery. Towards this aim, we created a measure of addiction mindset that is relevant for, but not specific to, nicotine addiction.

Study 1: Development of the Addiction Mindset Scale

Generating the item pool

Ten items were directly adapted from existing measures by replacing the mindset domain word (e.g. intelligence was changed to addiction) as used by most researchers (e.g., Schroder, Dawood, Yalch, Donnellan, & Moser, 2016). The authors of the present article, two of whom (JLH, JBB) have extensive experience in treating addiction, wrote and refined twelve additional items with input from a team of four researchers with expertise on fixed and growth mindsets. Twenty-two total items were created for initial testing (see supplement). Half of the items were reverse coded to address acquiescence response bias.

Method

Participants

A sufficiently large sample (N= 600) was recruited based on recommendations for scale development (Clark & Watson, 1995). Targeted recruitment was used to achieve a sample that had a balance of gender (50% female) and smoking status (50% non-smokers). Non-smokers were included because our goal was to develop a measure of mindset that can be used in a wide variety of populations. Participants were recruited via Amazon Mechanical Turk, which is widely used in behavioral research (Buhrmester, Kwang, & Gosling, 2011). Further, Mechanical Turk has proved to be a reliable recruitment method for smokers, people with substance use and misuse, and those with a varying set of addiction beliefs (Shapiro, Chandler, & Mueller, 2013; Wiens & Walker, 2015). The sample was 84% White, and the mean age of participants was 32.9 years (SD = 10.36). The majority had a high school education (89.6%) and were employed (86.5%). Among the sample that smoked, 24% smoked a pack of cigarettes or more per day.

Procedure

Participants rated their agreement with each of the 22 statements on a (1) strongly agree – (6) strongly disagree scale. After each statement, participants responded to a yes or no question: “Was the meaning of this statement very clear?” If they selected no, they were prompted to elaborate in an open-ended response.

Statistical Analysis

Exploratory factor analysis is the preferred method for exploring factor structure when there is no previous theory or data to guide factor selection for confirmatory analysis (Thompson, 2004). Since no previous work has explored the theory or measure of addiction mindsets, exploratory factor analysis was used to examine the factor structure among the items.

Results

To determine whether the factor structure was different across smokers and non-smokers, the 22 items were submitted to an exploratory factor analysis with principal axis factoring separately for smokers and non-smokers and the two scree plots were examined (see supplemental materials). In the smoker sample, the first factor alone accounted for 44.8% of

the total variance. Two additional factors had eigenvalues exceeding 1, but together they accounted only for an additional 15.8% of the total variance. In the non-smoker sample, the first factor alone accounted for 44.2% of the total variance. Three additional factors had eigenvalues exceeding 1, but together they accounted only for an additional 20% of total variance. Tucker's congruence coefficients (Korth & Tucker, 1975) were compared for the three factors that emerged in both samples. The first factor was nearly identical ($r_c = .99$), the second had a good overlap ($r_c = .96$) and the third factors were different ($r_c = .69$). Across both smokers and non-smokers, 21 out of the 22 items loaded on the first factor and clearly appeared to be assessing fixed vs. growth mindset. Despite the overlap in the second factor, we could not find any meaningful interpretation. Therefore, we retained the items that had clear loadings on the first factor, while removing ten items that loaded on multiple factors either in the smoker sample or in the non-smoker sample.¹ While over 90% of the respondents rated all the items as clear and therefore retained, two more items were removed for lack of clarity based on open-ended feedback from participants.

Based on the congruence between the results from the smoker and non-smoker samples, the two samples were combined, and a factor analysis was conducted with the remaining ten items. This analysis resulted in a 10-item solution loading heavily on a single factor. The scree plot indicated only one factor with an eigenvalue over one. This single factor solution accounted for 52% of the variance. Six of these items with the highest loadings were chosen (three of which are reverse coded) to keep the scale as short as possible for easy and time-efficient administration. When only these six items were included in factor analysis, the first and only factor with eigenvalues exceeding 1 accounted for 54.8% of the variance. The internal consistency of the scale consisting of these six items was relatively high (Cronbach's $\alpha = .83$). Further, the six-item version and the ten-item version were very highly correlated ($r = .97$), suggesting that a brief measure was sufficient. We named this scaled the "Addiction Mindset Scale (AMS)." Item loadings and descriptive statistics for the six items are presented in Table 1. The measure, with scoring and instructions, is available in the appendix. The mean score on the AMS was 3.35, median and mode scores were both 3.5 and the scores ranged between 1.17 and 4.83. Mean AMS scores for different demographic groups are in supplemental materials.

Study 2: Addiction mindset and psychological processes related to quitting smoking

Overview

As a first step towards examining the utility of the AMS in predicting behavior change, we examined the associations between addiction mindset and several psychological processes related to behavior change. First, we examined the relations between mindset and motivation to quit. We hypothesized that if people believe that addiction is not permanent (growth mindset), then they may believe that they will have a greater chance of successfully quitting (i.e., higher self-efficacy), which in turn increase their motivation to quit.

¹Among smokers, six items with high loadings on the first factor also had non-trivial loadings on the second or the third factor. Among non-smokers, seven items cross-loaded on the first and second, or first and fourth factors. One item ("addiction is something you either have or don't have") uniquely loaded on a third factor and was removed.

The third process we examined was commitment to quitting smoking, as characterized as a willingness to persist in staying abstinent despite the discomfort of withdrawal (Kahler et al., 2007). Growth mindset is known to be predictive of persistence in challenging situations (Burnette et al., 2012), so we hypothesized that a smoker with a growth mindset may be more willing to persist because of the belief that exerting effort can change an addiction. A fourth process we explored was the relationship between mindset and perception of barriers to cessation. People with a fixed mindset are more afraid of failing to achieve a goal because they perceive that failure only confirms the permanent quality in themselves (Dweck, 2006). For this reason, they may avoid trying to change and may perceive more barriers to quitting smoking. Alternatively, experiencing a lot of barriers may make people feel that addiction is more difficult to change.

Past research found that people with a fixed mindset tend to attribute failure more to an internal lack of ability than external reasons such as effort (Dweck, 1999; Dweck et al., 1995). Thus, the fifth process we explored was whether smokers' mindset was associated with attributing failure to a lack of ability vs. effort. Finally, we also examined whether mindset is related to participant characteristics such as current smoking status and level of dependence. We also controlled for them while examining the associations between mindset and the psychological variables above to determine the extent to which these associations were above and beyond their common association with smoking status and previous quit attempts. Finally, we examined whether growth mindset was associated with intention to quit in the future.

Methods

Participants

Participants who were current daily smokers ($N=200$) were recruited from Amazon Mechanical Turk. The mean age of participants was 31.93 years ($SD = 10.00$), the sample was 51% male, 84% White, smoked an average of 10 cigarettes every day (median = 5). The majority had a high school education (74%) and were employed (74%). The sample in this study did not have any repeat responders from Study 1.

Measures

Mindset

Participants completed the AMS as developed above in Study 1 (Cronbach's $\alpha = .86$). Higher scores indicate more growth mindset.

Motivation, confidence and commitment

Using a four-item measure (e.g. "Would you like to give up smoking if you could do so easily?" (Richmond, Kehoe, & Webster, 1993)), participants reported their levels of motivation to quit ($\alpha = .73$). They reported their self-efficacy or confidence in cutting down number of cigarettes smoked and quitting completely (e.g. "If you decided to quit smoking completely, how confident are you that you would be able to do it?") on a four-point scale ($\alpha = .78$; Crittenden, Manfredi, Warnecke, Cho, & Parsons, 1998). Participants completed an eight item measure of commitment to quitting smoking using the Commitment to Quitting

Scale (CQSS; $\alpha = .93$) (Kahler et al., 2007; e.g., “I’m willing to put up with whatever discomfort I have to in order to quit smoking”).

Barriers to smoking cessation

Next, participants completed the perceived barriers to quitting smoking checklist ($\alpha = .78$) (Abrams et al., 2003) which assesses smokers’ endorsements of common reasons that get in the way of someone being able to quit successfully (e.g. “I don’t know how to go about quitting smoking”).

Smoking history, current smoking and future quit intention

Participants completed the 6-item Fagerström Test of Nicotine Dependence (FTND) (Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991), and reported the number of cigarettes they smoked per day. Participants self-reported the number of quit attempts they made (willingly going 24 hours at least without smoking with an active intention to quit) in the past 12 months. They also reported whether they intended to quit in the next week, month, year, later than a year, or did not intend to quit at all.

Attributions for failure

We used a hypothetical failure scenario, which has been used in similar research to ethically assess people’s reactions to failure while reducing the risk for adverse consequences (Burnette, 2010; Grant & Dweck, 2003). Participants imagined the following scenario, “You decide to quit smoking because you want to improve your health. After you decide to quit, you remove all the cigarettes from your house and just stop smoking cold turkey. A week after you quit, you start smoking again.” Following this, they were asked, “Why do you think you started smoking again in this scenario?” and asked to rate two possible explanations for failing to quit on a strongly agree to strongly disagree scale. One measured attribution to lack of ability to quit: “I started smoking again because I was not able to overcome my addiction” and the other measured attribution to lack of effort: “I started smoking again because I did not try hard enough”). The order in which the surveys and scenario were presented was counterbalanced.

Statistical Analyses

Linear regression was used to test for associations between mindset and all other variables. Binary outcome variables were logit transformed (i.e., we used a logistic regression). Because the association between mindset and motivation, self-efficacy, or commitment could simply be a reflection of how much people smoke or their quit history, all regression analyses controlled for these covariates: number of cigarettes smoked per day and previous quit attempts. Analyses also controlled for age of participants since age may affect responses to motivation, commitment, etc. To limit the overall Type I error, corrections are required when multiple tests are performed to support a single hypothesis (Bender, 2001). Since our analyses were primarily exploratory and we did not perform multiple tests on the same hypothesis, we did not add corrections for multiple analyses in this study.

Results

Current smoking and quit attempts

As shown in Table 2, scores on the AMS² were not significantly correlated with the number of cigarettes smoked per day ($r = .07, p = .66$), severity of nicotine dependence ($r = -.02, p = .77$), number of previous quit attempts in the past 12 months ($r = .04, p = .87$) or intention to quit in the next month (OR = 1.16 [95% CI: 0.76, 1.77], $p = .50$), six months (OR = 1.29 [95% CI: 0.88, 1.90], $p = .19$), or one year (OR = .81 [95% CI: 0.60, 1.10], $p = .18$).

Motivation, commitment and confidence

Table 3 presents details on all regression models (controlling for number of cigarettes smoked per day, age and previous quit attempts). Higher scores on the AMS were positively associated with motivation to quit ($\beta = .17, p = .02$) and commitment to quitting ($\beta = .37, p < .001$). Higher AMS scores were also associated with higher self-efficacy to cut down on cigarettes ($\beta = .28, p < .001$) and to quit completely ($\beta = .36, p < .001$). The results were highly similar to the zero-order correlations (see Table 2).

Barriers to cessation

In smokers, higher AMS scores were associated with perception of fewer self-reported barriers that prevented cessation ($\beta = -.29, p < .001$).

Attribution of failure

Smokers with higher AMS scores were less likely to attribute their failure to quit smoking to lack of ability to quit although this was not significant ($\beta = -.13, p = .11$). However, higher AMS scores were significantly associated with effort attribution ($\beta = .17, p = .02$), such that people with a growth mindset were more likely to attribute their imagined failure to lack of effort.

Discussion

The present studies extend the research on fixed vs. growth mindsets to the domain of addiction. First, we developed and refined a measure of addiction mindset. The AMS consists of a single factor representing addiction mindset, anchored by fixed mindset about addiction at one end and growth mindset at the other end. This is very similar to other fixed vs. growth mindset scales (Dweck et al., 1995), which also treat mindset as a single, bipolar dimension. The AMS is internally consistent, has face validity and has a consistent factor structure across both smokers and non-smokers. Future research on this measure should expand on the validity of this scale by examining divergent validity and correlations with potentially related constructs as well. Using this measure, Study 2 showed that addiction mindset was associated with psychological processes related to quitting smoking. Smokers who endorsed a growth mindset were more motivated to quit smoking, more committed to quitting and had greater self-efficacy to cut down on their smoking and quit completely. These results are consistent with past research on fixed vs. growth mindset in other domains;

²The mean, median and mode score on the AMS in study 2 was 4.00. The scores ranged from 1.16 to 6.

people with a growth mindset tend to have positive expectations that their efforts to change will be successful and have greater persistence (Burnette, 2010; Dweck et al., 1995).

The results suggest that if a quit attempt is unsuccessful, smokers with a fixed mindset may attribute the failure to a lack of ability to overcome addiction. This finding is consistent with similar studies in the domain of intelligence (Dweck et al., 1995). Attributing cessation failure to stable factors (e.g. “that’s the sort of person I am”) is likely to lead to the expectation that they will fail again in future, and those expectations can manifest in lower quit rates (Eiser, van der Pligt, Raw, & Sutton, 1985). These initial findings may be helpful for developing interventions based on mindset for addictive behaviors including smoking cessation. Taking into consideration that motivational interventions focused on fostering a growth mindset in other domains such as personality (Yeager et al., 2014), body weight and dieting (Burnette & Finkel, 2012) and anxiety reduction (Schleider & Weisz, 2017) have been successful at changing behavior in the long term, there is potential in investigating a growth mindset intervention for addictive behaviors.

It may seem surprising that mindset was not associated with current smoking or quit history (Study 2). However, only daily smokers were eligible to participate in Study 2. Thus, even if people with a growth mindset were more likely to succeed in quitting smoking, they would not be in the study. Future research should therefore include a broader variety of smokers, including less than daily smokers. Further, mindset studies in other domains have found similar relationships between specific mindsets and attributes themselves. For example, personality mindsets do not directly covary with actual personality traits (Spinath, Spinath, Riemann, & Angleitner, 2003) and mindsets about empathy do not relate to actual endorsement of empathy (Schumann, Zaki, & Dweck, 2014). The lack of correlations between AMS and current smoking, previous quit attempts and dependence therefore, speak to the discriminant validity of the AMS. Further, related research on body weight has found that mindset may not have a direct effect on outcomes (e.g. BMI) but may have indirect effects on weight by affecting related psychological processes such as coping skills or expectations of success (Burnette, 2010). Similarly, addiction mindset may affect psychological processes such as self-efficacy or commitment to quitting, which are known to predict successful quitting. Prospective research is necessary to assess the effects of growth vs. fixed mindset on successful smoking cessation and understand the mediational pathways through which mindset may influence cessation.

Limitations

We cannot draw conclusions about causal effects of mindset on quitting smoking from this study. For example, while it is possible that having a growth mindset makes people motivated, it is also possible that people who are motivated develop have a growth mindset. While it is a first step towards exploring the utility of addiction mindsets, more work needs to be done to explore its association with other related constructs. In addition, the data for the present studies were collected from a convenience sample using Amazon Mechanical Turk. It is not known whether the results generalize beyond this sample. The sample did not include people from a broad range of races and ethnicities, or income and socioeconomic

levels, and the samples used in this study may not represent the population of smokers in the United States. The results may therefore vary across different demographic groups.

Conclusions

The present studies extended mindset theory to the domain of addiction. Among daily smokers, growth mindset was associated with higher motivation to quit smoking, commitment to quitting, self-efficacy to quit smoking, perception of fewer barriers to cessation, and to attributions of quit failure to insufficient effort (rather than lack of abilities). The findings suggest the potential of future research exploring how addiction mindsets relate to behavior change for not just smoking cessation, but many types of addictive behavior, and for exploring the possibility of changing mindsets to change addictive behavior.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding for this project comes from the Hutch United Doctoral Fellowship awarded to Vasundhara Sridharan and from National Cancer Institute R01CA192849 awarded to Jonathan Bricker. Funders had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication.

Appendix – A Addiction Mindset Scale

Below are some statements that people make about addiction, please choose whether you agree or disagree with each of them. In this survey, we are only referring to addiction to nicotine, i.e., from cigarette smoking. Please keep this in mind while reading the statements.

Participants' responses to each item was coded on a scale of 1 (strongly agree) to 6 (strongly disagree). Items #3, #4 and #5, the growth mindset items, are reverse coded. The average is used as an AMS score, where higher scores indicate more growth mindset. The possible scores on this scale range from 1 to 6.

	Strongly Agree	Agree	Mostly Agree	Mostly Disagree	Disagree	Strongly Disagree
1. A person's addiction can never fully leave them.	☐	☐	☐	☐	☐	☐
2. Some people will always be addicted, and there's not much they can do about it.	☐	☐	☐	☐	☐	☐
3. People can change how addicted they are.	☐	☐	☐	☐	☐	☐
4. Anyone can always overcome an addiction.	☐	☐	☐	☐	☐	☐
5. If they keep trying despite setbacks, people can get over their addiction.	☐	☐	☐	☐	☐	☐
6. You can't really change how addicted you are.	☐	☐	☐	☐	☐	☐

Appendix – B. All 22 items used in Study 1.

Fixed Mindset Items

- "The extent to which a person is addicted is something basic about them and it can't be changed very much."
- "A person can learn new ways to break a habit, but they can't really change their basic addiction."
- "Whether a person is addicted or not is deeply ingrained in that person. It cannot be changed very much"
- "Even with great effort, some people are not able to change their addiction."
- "Once you get addicted, the addiction is always a part of you that won't ever change even if you manage to stop using the substance."
- "People who are addicted will always be addicted to some extent, and they can't really do much to change it."
- "Once an addict, always an addict"
- "You can't really change how addicted you are."**
- "A person's addiction can never fully leave them"**
- "Some people will always be addicted, and there's not much they can do about it."**
- "Addiction is something you either have or don't have."

Growth Mindset items

- "Addiction is a series of choices, and people can end their addiction by making different choices."
- "With effort, people can get over their addiction."
- "No matter how addicted you are, you can always change quite a bit."
- "People can always substantially change how addicted they are."**
- "People do get addicted, but they can recover from the addiction with effort."
- "If an addicted person gets help, they will be able to change."
- "You can be addicted a little or a lot, and that can change."
- "People who learn from their addiction can overcome it."
- "People can learn to control their addictions."
- "Anyone can always overcome an addiction."**
- "If they keep trying despite setbacks, people can get over their addiction."**
-

Note. Bolded items indicate the items that were included in the final scale. Note that although one item ("you can't really change how addicted you are") uses a pronoun that may be perceived self-referent, it is intended to refer to people in general. Given that this item did not stand out for non-smokers vs. smokers in qualitative or quantitative responses, it is very likely that the "you" was interpreted as "people in general" as intended.

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Table 1
Factor Loadings and Descriptive Statistics of Addiction Mindset Scale Items from Study 1

Scale items	Factor Loadings	Mean (SD)
A person's addiction can never fully leave them.	.77	3.74 (1.40)
People can change how addicted they are.	-.74	2.78 (1.26)
Some people will always be addicted, and there's not much they can do about it.	.76	3.93 (1.40)
You can't really change how addicted you are.	.74	4.40 (1.26)
Anyone can always overcome an addiction.	-.75	2.94 (1.38)
If they keep trying despite setbacks, people can get over an addiction.	-.77	2.31 (1.03)

Note. All six items load heavily on a single factor, designated as fixed vs. growth mindset of addiction.

Table 2

Bivariate correlations between measures used in Study 2

	AMS	CPD	FTND	Quit attempts	Motivation	Commitment	Self-efficacy	Perceived barriers
AMS								
CPD	.07							
FTND	-.02	.38**						
Quit attempts	.04	-.09	-.05					
Motivation	.18*	-.07	-.05	.30**				
Commitment	.37*	-.14	-.10	.20**	.52**			
Self-efficacy	.36**	-.17*	-.20**	.26**	.36**	.60**		
Perceived barriers	-.28**	.32**	.15*	-.14*	-.10	-.38**	-.42**	

Note. AMS Addiction Mindset Scale, CPD Cigarettes per day, FTND Fagerstrom Test of Nicotine Dependence

* $p < .05$.

** $p < .01$

Table 3

Regression analysis from Study 2 predicting smoking related variables from AMS score, age, cigarettes per day and quit attempts.

Variables	Adj. R ²	β	Weight (B)	95% CI for B	t-value	p-value
DV: Motivation	0.10					
AMS		0.17	0.37	0.07-0.68	2.42	.02
Age		0.01	0.01	-0.03-0.03	0.17	.87
CPD		-0.07	-0.01	-0.04-0.01	0.90	.37
Quit attempts		0.28	0.09	0.05-0.14	4.12	<.001
DV: Commitment	0.17					
AMS		0.37	0.32	0.20-0.43	5.50	<.001
Age		0.01	0.00	-0.01-0.01	0.13	.10
CPD		-0.15	-0.01	-0.02-0.00	-2.18	.03
Quit attempts		0.16	0.02	0.00-0.04	2.35	.02
DV: Self-efficacy	0.18					
AMS		0.33	0.33	0.86-2.18	5.05	<.001
Age		-0.13	-0.01	0.20-0.45	-1.94	.05
CPD		-0.13	-0.01	-0.03-0.01	-1.87	.06
Quit attempts		0.22	0.03	0.01-0.05	3.30	.001
DV: Perceived barriers	0.19					
AMS		-0.29	-0.11	-0.17- -0.06	-4.41	<.001
Age		-0.11	-0.01	-0.01-0.00	-1.68	.09
CPD		0.36	0.01	0.01-0.02	5.34	<.001
Quit attempts		-0.09	-0.01	-0.01-0.00	-1.40	.16
DV: Ability attribution	0.04					
AMS		-0.13	-0.12	-0.26-0.03	-1.63	.11
Age		0.20	0.02	0.01-0.04	0.20	.01
CPD		0.02	0.00	-0.01-0.1	0.02	.75
Quit attempts		0.05	0.01	-0.01-0.03	0.05	.45
DV: Effort attribution	0.01					
AMS		0.17	0.19	0.03-0.36	2.30	.02
Age		0.04	0.01	-0.01-0.02	0.57	.57

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Variables	Adj. R ²	β	Weight (B)	95% CI for B	t-value	p-value
CPD		0.01	0.00	-0.01-0.01	0.11	.91
Quit attempts		0.05	0.01	-0.02-0.03	0.64	.52

Note. AMS – Addiction Mindset Scale. Higher scores indicate more growth mindset. CPD Cigarettes per day.