



What Happens When You Smoke a Cigarette Mindfully? A Deductive Qualitative Study

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Abstract

Objectives The mindful smoking exercise instructs participants to pay attention to a range of experiences while smoking a cigarette with the expectation that it will modify the often automatic process of smoking. Given its theoretical value, mindfulness- and acceptance and commitment therapy–based smoking cessation interventions have usually included a mindful smoking exercise. However, its utility has not been empirically examined. Through qualitative analyses, the current study examined smokers' lived experience with mindful smoking during an 8-week telehealth group–based smoking cessation and alcohol modification trial.

Methods Participants were smokers who were present in group during the mindful smoking exercise. The recordings of sessions and follow-up interviews in which discussion on mindful smoking took place were transcribed and hand-coded for qualitative analysis. A thematic content analytic approach was used to identify themes.

Results Participants ($N = 20$) were 75% female (mean age = 49.75, average cigarettes per day = 16.35). Identified themes mapped onto both the theoretical rationale for mindful smoking (e.g., attention/awareness, decentering, similarity/difference between mindful versus automatic smoking) and cognitive-affective-behavioral responses (e.g., unpleasant/pleasant experience, shifts in desire to smoke, cognitive reappraisal). The most prominent themes were attention/awareness, similarity/difference between mindful versus automatic smoking, and unpleasant/pleasant experience. Dynamic interplay between themes was also observed and representative quotes are included.

Conclusions Our findings indicate that intentionally paying attention to smoking led to the reporting of a heightened awareness of automatic behavior accompanied by noticing unpleasant aspects of smoking, potentially facilitating change in one's relationship to smoking. Theoretical implications of mindful smoking in the context of addiction are discussed.

Keywords Mindful smoking · Smoking cessation · Qualitative analysis · Cigarette smoking · Mindfulness

Cigarette smoking remains the leading preventable cause of morbidity and mortality (U.S. Department of Health and Human Services, 2020). Numerous attempts to alter smoking behaviors have led to the development of efficacious

smoking cessation interventions, and mindfulness is one promising treatment approach that may enhance smoking abstinence (Korecki et al., 2020; Li et al., 2017; Oikonomou et al., 2017). Mindfulness is operationalized as the

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ability to purposefully bring nonjudgmental awareness to the immediate experience and to pay attention to the present moment with openness and acceptance (Bishop et al., 2004; Kabat-Zinn, 2013). Mindfulness has been theorized to disrupt the automatic response (e.g., smoking) to craving and rewarding stimuli (e.g., cigarette cues; Breslin et al., 2002) by targeting the associative learning process between affective states (e.g., negative or positive affect) that lead to heightened craving and, thus, smoking (Brewer et al., 2013). Both the positive (Glautier, 2004) and the negative reinforcing effects of smoking (Baker et al., 2004) contribute to the development and maintenance of habitual smoking. Here, mindfulness brings intentional and controlled attention to the reinforcement processes of smoking that became highly automatized (Breslin et al., 2002; Brewer et al., 2013).

Overall, extant theoretical models highlight the role of triggers in nicotine use disorder, and many intervention approaches emphasize identifying triggers and learning coping skills to mitigate craving (Baker et al., 2004; National Cancer Institute, 2008; Robinson & Berridge, 2008). Despite the short-term efficacy of such intervention approaches, relapse is high, which might be due to a lack of focus on the experiential components of smoking that contribute to automatic smoking (i.e., what a person cognitively, emotionally, and physically experiences at the time of smoking). The cognitive processing model provides a framework that emphasizes the need to actively bring cognitive awareness to smoking behavior itself to disrupt automatic smoking (Tiffany, 1990).

The cognitive processing model highlights the automaticity of addiction such that smoking is maintained because conscious awareness is no longer required once procedural memory of smoking behavior is acquired; smoking becomes automatic (Tiffany, 1990). Specifically, an action script to smoke will be stored in procedural memory after many smoking episodes, which facilitates the automaticity of smoking. Thus, to reverse and inhibit highly automatized smoking behavior, cognitive efforts to bring conscious awareness to such automaticity are needed.

If smoking behavior is highly automatic, smoking a cigarette mindfully by intentionally paying attention to the ongoing experience before and during smoking may disrupt the automaticity loop. During mindful smoking, individuals are instructed to pay full attention to smoking and the momentary experience including physical sensations (e.g., taste, smell, breathing) without engaging in other activities (e.g., looking at phone, driving, talking with someone else). Conscious awareness to cognitive-affective reactions and to physical sensations involved in smoking may increase awareness to how automatic one's smoking behavior is and may alter the memories/associations involved with smoking (e.g., smoking may not actually be very pleasurable). As a result, a new memory may develop such that smoking is

not automatically associated with pleasurable sensations. A mindful smoking practice facilitates an individual staying in the present moment and bringing awareness to the stream of internal and external experiences that enter the field of awareness (Hölzel et al., 2011; Schuman-Olivier et al., 2020; Vinci et al., 2021), learning to inhibit automated behaviors (e.g., Craske et al., 2018). Mindful smoking is hypothesized to increase the salience of the sensations involved in the experience of smoking (e.g., taste, smell) that then results in a different relationship with smoking (e.g., displeasure).

Theoretically, mindful smoking slows down automatic smoking behavior and encourages individuals to bring awareness to a range of experiences of cigarette smoking. Mindful smoking has been used in mindfulness- and acceptance and commitment therapy-based smoking cessation trials (Brewer et al., 2011; Davis et al., 2014; Gifford et al., 2011). It is hypothesized that mindful smoking may aid in breaking the automatic smoking process such that despite receiving nicotine, an individual starts paying attention to other aspects of smoking not usually noticed, potentially leading to a change in their own relationship to smoking (Vinci et al., 2021). This approach to smoking is thought to be quite different than the typical automatic, or perhaps even distracting, manner in which smoking usually takes place.

Despite its theoretical and practical value, to date, mindful smoking has not been empirically examined. It is possible that an individual may have an aversive reaction (e.g., the taste of the cigarette being gross) to such increased awareness (Brewer, 2019) or that mindful smoking reinforces the more favorable aspects of smoking (e.g., physical relaxation). If the former is found, incorporating mindful smoking into other cessation treatments may be warranted, but the latter would suggest that mindful smoking could even have detrimental effects on quitting. As a first step, the current study investigated smokers' lived experience with mindful smoking during an 8-week telehealth group-based smoking cessation and alcohol modification trial (Hemenway et al., 2020; Vinci et al., 2022). Specifically, we analyzed the themes of participants' audio-recorded verbal responses following mindful smoking exercises. Our qualitative analysis aims to elucidate themes that map onto the theoretical rationale for mindful smoking (e.g., addressing automaticity), as well as unfolding reactions to the exercise (e.g., pleasant vs unpleasant). Given the current study is a secondary analysis of a larger pilot clinical trial that aimed to test the feasibility and acceptability of a novel mindfulness-based relapse prevention treatment for smoking cessation and alcohol modification, a deductive coding method was used. Specifically, the following research questions guided the overall analysis: (1) What theoretical mindfulness constructs were observed in the discourse following engagement in mindful smoking? (2) What cognitive, emotional, and behavioral responses occurred during/after mindful smoking?

Methods

Participants

Participants were daily smokers who reported binge drinking, and who were randomized to the mindfulness treatment (Mindfulness-Based Relapse Prevention for Smoking and Alcohol [MBRP-SA]) as part of a pilot RCT (ClinicalTrials.gov identifier: NCT03734666). Inclusion criteria were (a) ≥ 18 years of age, (b) smoking ≥ 3 cigarettes per day (CPD) for the past year, (c) motivated to quit smoking and change alcohol use within the next 60 days, (d) consuming ≥ 5 (males) or ≥ 4 drinks (females) on at least one occasion in the past month, (e) willingness and ability to attend the 8 weekly telehealth group sessions, (f) willingness and ability to use an email account for study materials, (g) valid home address in the state of Florida or Georgia, (h) functioning telephone number, and (i) ability to speak, read, and write in English. Exclusion criteria were (a) contraindication for the nicotine patch, (b) current substance use disorder other than an alcohol use disorder, (c) an active psychotic disorder, (d) current use of tobacco cessation medications, (e) pregnancy or lactation, and (f) a household member already enrolled in the study. During the phone screen, the Mini-International Neuropsychiatric Interview for Substance Use and Psychotic Disorders (Sheehan et al., 1998) and the Timeline Followback for tobacco and alcohol use (Sobell & Sobell, 1992, 2000) were conducted to determine eligibility.

Procedures

All procedures were approved by the institution's Institutional Review Board (IRB). The protocol paper describes the full study procedure and treatment details (Hemenway et al., 2020; Vinci et al., 2022). The study was conducted fully remotely, with group sessions conducted via Zoom. Briefly, participants who were deemed eligible following a phone screening were scheduled for a phone orientation session during which participants' verbal consent was obtained. After orientation, a REDCap survey link to complete baseline self-report measures was sent via email and treatment materials were mailed; participants were scheduled for a group Zoom orientation session which occurred 1 week prior to the first treatment session. A tablet with a camera and data plan was loaned to participants as needed (Vinci et al., 2022).

Participants attended telehealth group treatment for 8 weekly, 2-h sessions via Zoom and started nicotine replacement therapy beginning on the quit day (session 5). Two follow-up phone sessions were scheduled at 8 and

16 weeks post quit date. Participants were compensated up to \$200 for the completion of study assessments. All treatment sessions were recorded. Portions of sessions 3 and 4 that specifically discussed mindful smoking, as well as the audio-recorded follow-up interview at 8 weeks that discussed mindful smoking, were transcribed for a qualitative analysis.

Mindful Smoking At the end of session 2, participants were introduced to mindful smoking and instructed to smoke a cigarette mindfully immediately preceding the start of session 3 (e.g., about 5 min beforehand). Participants were instructed to only pay attention to the act of smoking including what happened immediately before, during, and after smoking, without distractions such as looking at their phone, having a conversation, or taking a walk. If thoughts arose, participants were instructed to note them and return their attention back to the act of smoking. Since the smoking quit date was not scheduled until session 5, participants were still smoking at the time mindful smoking was introduced. If someone had already quit or cut back such that they did not want to participate, they were encouraged to bring mindful awareness to the present moment in general (i.e., without mindfully smoking), which rarely occurred.

Since participants were told to smoke a cigarette mindfully immediately before the start of session 3, session 3 began in silence. The instructor then began the session with a mindfulness meditation of the present moment, instructing participants to focus on the experience in the body and mind following smoking a cigarette mindfully. Inquiry followed, where the facilitator queried for what participants noticed and experienced during mindful smoking and the meditation practice. The inquiry process utilized three key questions to promote awareness of direct experiences of smoking (Chawla et al., 2010; Crane et al., 2017): (1) What did you notice? (2) Was it similar to or different from usual smoking? (3) How does mindful smoking relate to quitting and relapse? Participants were then encouraged to continue to smoke every cigarette mindfully over the next week. At the beginning of session 4, the facilitator briefly checked in on how mindful smoking during the previous week went, encouraging participants to continue to smoke mindfully until the quit day. Finally, during the 8-week interview (i.e., which was 4 weeks post end of treatment/8 weeks post quit date), participants were asked to share their thoughts about the mindful smoking exercise.

Measures

Demographic information was collected at baseline including gender, age, race, ethnicity, education, smoking, and alcohol use history. During the follow-up interview,

participants were asked, “What are your thoughts on the mindful smoking exercise that occurred before the quit day?”.

Data Analysis

All session recordings were transcribed verbatim by study staff. Specifically, per the manualized treatment protocol, mindful smoking was discussed in sessions 3 and 4; the portions of these recorded sessions in which mindful smoking was discussed were identified, after which the study staff transcribed the audio content to written text. Independent research staff then checked the accuracy of the written text. Regarding the follow-up interviews, the entire recorded interviews were transcribed from audio to text and cross-checked for accuracy following the same procedures used for the session transcriptions. The portions of the follow-up interviews that asked about mindful smoking were selected for the current analyses. Next, thematic content analysis to identify themes among the transcripts relevant to mindful smoking was conducted (Strauss & Corbin, 1998). The coders were the first and

the last authors (MJY, CV) whereas the second author (DK) oversaw the process of developing the code book. The coders were doctoral-level clinical psychologists who at a minimum were familiar with the theoretical models of mindfulness, were formally trained in the provision of mindfulness-based interventions, had completed an 8-week formal course on Mindfulness-Based Stress Reduction and at least one multi-day silent retreat, and had a personal mindfulness practice. The coders did not deliver the intervention to participants.

Prior to initiating coding, a priori codes were developed that were based on Kabat-Zinn’s theoretical framework on mindfulness (2013) with additional frameworks of well-known and broadly used mindfulness measures (Baer et al., 2006; Brown & Ryan, 2003; Lau et al., 2006) and anticipated tobacco-related affective (negative and positive affect) and behavioral (e.g., acute decrease in smoking) responses. Initial a priori codes were developed with the expectation that additional codes would develop iteratively during the coding and analysis processes. The coding manual and codebook were developed following existing guidelines (DeCuir-Gunby et al., 2011; MacQueen et al., 1998; Stuckey, 2015).

Table 1 Structure of codebook and number of participants who endorsed each theme

Code	<i>N</i>	Definition
Attention/Awareness		
Attention/awareness	14	Intentionally paying attention to and bringing awareness to the present experience
Autopilot	10	Paying attention to the automatic pattern of smoking
Decentering	9	A shift in perspective to observe one’s experience from an outside perspective
Curiosity	2	Willingness to learn more about a specific experience
Nonjudgment/Judgment	4	Presence of self-criticism/judgment about or acceptance of an ongoing experience
Similarity/Difference	12	Awareness of how similar/different an experience is, based on previous experience
Unpleasant/Pleasant Experience		
Unpleasant experience—overall	4	The general expression of unpleasant experience without using specific examples of emotions or physical sensations
Unpleasant experience—negative affect	1	Emotion words that express feelings of negative affect
Unpleasant experience—physical	9	Unpleasant physical sensations such as smell and taste
Pleasant experience—overall	3	The general expression of pleasant experience without using specific examples of emotions or physical sensations
Pleasant experience—positive affect	1	Emotion words that express feelings of positive affect
Pleasant experience—physical	4	Pleasant physical sensations such as smell and taste
Smoking Behavior		
Acute decrease of smoking	3	Indication that smoking stopped within a matter of minutes
Acute increase of smoking	–	Indication that smoking increased within a matter of minutes
Long-term decrease in smoking	2	Decrease in the number of cigarettes smoked in the next few days/over time
Long-term increase in smoking	–	Increase in the number of cigarettes smoked in the next few days/over time
Desire to Smoke		
Decrease in desire to smoke	3	Expression of decrease in desire to smoke
Increase in desire to smoke	1	Expression of increase in desire to smoke
Cognitive Reappraisal	8	Willingness to apply what was learned from mindful smoking to future behavior
Helpfulness/Usefulness	6	Expression of the perceived utility of mindful smoking during the follow-up interview that was practiced over the course of treatment

The complete list of codes and definitions is found in Table 1.

During the coding process, each coder individually coded the same transcript and then met with the other coder to compare and discuss the codes, including any discrepancies. Discrepancies were discussed until a consensus was met. All transcripts were coded in this manner. There were 9 coding meetings in total.

Results

Four separate cohorts of participants completed mindful smoking. Twenty participants' discourses in the MBRP-SA group sessions were coded from sessions 3 and 4. The number of participants by cohort, session, and follow-up interview are presented in Supplementary Table 1. Specifically, there were 6 participants in the 1st cohort, 4 in the 2nd, and 5 in both the 3rd and 4th cohorts who participated in sessions 3 and 4. Of those, the discourse of 3 participants in the 1st cohort and 1 participant in the 3rd and 4th cohorts was not coded due to either no participation in the discussion ($n=2$) or their discourse being irrelevant to the mindful smoking exercise ($n=3$). Mindful smoking was discussed an average of 14.9 min in session 3 and 5.6 min in session 4. For the follow-up interview, 11 participants' responses are reported. Since the majority of the data obtained were from sessions 3 and 4, we include the demographics of all 20 participants. Participants were 75% female and had a mean age of 49.75 ($SD=9.99$), with 55% identifying as White, 40% as Black/African American, 5% as more than one race, and 10% as Hispanic/Latinx; 35% had a GED/high school diploma level of education or less. Mean cigarettes per day were 16.35 ($SD=11.19$; median = 15; range = 1–45), mean number of drinking days per week was 3.90 ($SD=1.92$; median = 3; range = 2–7), and mean number of drinks per drinking day was 5.26 ($SD=3.62$; median = 4; range = 2–18).

Six categories of a priori codes (attention/awareness, decentering, curiosity, nonjudgment/judgment, unpleasant/pleasant experience, and smoking behavior) are discussed below. Another four categories of codes (similarity/difference, desire to smoke, cognitive reappraisal, and helpfulness/usefulness [at follow-up interview only]) emerged and are discussed in detail below. For each theme, the definition of the theme along with quotes from participants and a brief discussion on its relevance to the broader mindfulness and tobacco literature are presented. Table 1 shows the number of participants who endorsed each theme.

Attention/Awareness

The *attention/awareness* category included two subcodes: (1) attention/awareness and (2) autopilot. The subcode

attention/awareness was defined by intentionally paying attention to the present moment and bringing awareness to ongoing experience (Brown & Ryan, 2003; Kabat-Zinn, 2013). It included themes such as noticing physical sensations or one's own cognitive-affective responses while mindfully smoking. Many participants reported physical sensations as an immediate consequence of smoking that seemed to become more salient once they started to pay full attention to smoking. Some participants reported increased awareness of triggers to smoke (e.g., pain).

... you really don't taste it unless you really, you know, put your attention to it, and you know, it is your mouth just tastes gross and you know, just the smell of it... I noticed like breathing-wise it's like my chest feels really heavy, when you are concentrating on your breathing sometimes. (Participant 404, female, 53 years old, session 3)

Yes, what I noticed [was that] I was able to taste the nicotine more, you know, and ... I was able to feel the tingling sensation ... I was able to feel the effect of the nicotine in my body... I felt in my arms and in my hands... in my legs... I can feel the effect of the nicotine in my body. (Participant 405, female, 50 years old, session 3)

And now I'm starting to realize how much I'm smoking even at night because of the pain, like, like, that cigarette's going to help take that pain away. (Participant 305, female, 61 years old, session 4)

... it helped me to realize what was causing me to smoke. (Participant 405, female, 50 years old, follow-up interview)

The subcode *Autopilot* was defined by paying attention to the automatic pattern of smoking that had not been otherwise noticed (Baer et al., 2008). The themes of this subcode centered around noticing one's own reflexive and mechanistic smoking behaviors through mindful smoking.

... I've gone through the past 30 years of doing it [smoking], just, I don't know, not really paying much attention to it. ... I usually am so busy doing stuff when I'm smoking. I'm not very rarely ever just sitting there doing absolutely nothing thinking about the cigarette that I'm smoking... It's after dinner, you know, and then it's a cigarette time. (Participant 204, female, 50 years old, session 3)

... it's habit. You know, it, you screw one into your face, you light it up, and you go on about what it is that you're doing. ... I usually putter in the shop or work in the garden or, you know, whatever I'm doing. I'm not paying attention to what's going on. ... a continuation of a habit that I've had for 40 years... (Participant 302, male, 48 years old, session 3)

... when I'm normally smoking you know, I don't think. I just smoke smoke smoke smoke, inhale inhale... (Participant 405, female, 50 years old, session 3)

... it made me realize that ... I was smoking more like... automatically. (Participant 204, female, 50 years old, follow-up interview)

Decentering

Decentering refers to a shift in perspective such that one can observe thoughts/feelings/sensations from an outside perspective (vs being caught up in them) in the present moment (Lau et al., 2006; Teasdale et al., 2002). In the context of mindful smoking, this theme primarily included the sudden questioning of why one keeps smoking and the emergence of thoughts about the aversive impact of smoking on health. This theme was coded when participants observed an immediate "in the moment" response to mindful smoking indicative of decentering. Overall, bringing awareness to the ongoing raw experience of smoking appears to create cognitive dissonance, as participants questioned why they smoke despite aversive consequences, reflective of the ability to observe their automatic smoking with a decentered perspective (Teasdale et al., 2002).

... when I was smoking I was like, 'Why am I smoking this? It's not like I really need it.' (Participant 106, female, 58 years old, session 3)

... it reminds me that smoking is damaging to my, it effects my cardiovascular system, and will probably kill me. (Participant 402, male, 60 years old, session 3)

... but most of the time it [mindful smoking] will lead to, well okay, well why are you doing this or can we do something different or, you know, more what was I getting out of it? (Participant 203, male, 53 years old, session 4)

... stopping and thinking about why do I really want this, or am I really enjoying this. (Participant 204, female, 50 years old, follow-up interview)

Curiosity

Curiosity was defined by a willingness to learn more about an ongoing cognitive or affective experience (Lau et al., 2006). Brewer distinguishes curious awareness from mere behavioral substitution (e.g., distraction) that is typically recommended in conventional smoking cessation treatment (2019). Specifically, through mindfulness practice, one's reward seeking shifts from external behavior (smoking) to internal behavior (curiosity), which leads to an awareness of a lack of reward from smoking. Through mindful smoking, the rewarding value of cigarette smoking would decrease

because of its unpleasant properties. We coded curiosity when participants expressed interest/wonder about the raw experience of smoking (e.g., interest in how the smoke looked rising from a cigarette; curiosity about how smoking impacts thoughts or emotions). Although curiosity was rarely noted in the current sample, participants did indicate wanting to see what happens if they continue smoking a cigarette by paying full attention. It is possible that curious awareness is cultivated over time through regular mindfulness practice and would not necessarily be explicit immediately following an initial mindful smoking exercise (Lau et al., 2006). Oftentimes, participants conveyed the quality of curiosity while sharing what they noticed during mindful smoking, although their verbatim responses did not explicitly express wanting to learn more about their present experience.

... it was like I did when I first tried to be cool to smoke a cigarette, I was just inhaling and blowing it out because I was trying so hard to see how it makes me feel and thinking about it. (Participant 202, female, 51 years old, session 4)

Nonjudgment/Judgment

Nonjudgment/judgment refers to whether judgmental thoughts arise that are negative or self-blaming in nature vs whether one has an acceptance/nonjudgmental approach toward ongoing experience (Baer et al., 2008). During mindful smoking, this theme centered around labeling one's smoking behavior as bad or good. Acceptance of ongoing experience was rarely noted.

Given that mindful smoking occurred at the beginning of MBRP-SA, it is not surprising that participants reported judgmental thoughts around smoking behavior. Acceptance of present-moment experience is likely to appear at a later stage of the treatment and/or among experienced meditators, cultivated through regular mindfulness practice (Baer et al., 2004; Gu et al., 2016).

I felt guilty smoking it. ... I just felt guilty because I know that there is other things I could be doing that won't harm my body, you know. (Participant 201, female, 54 years old, session 3)

... you are just kind of smoking and you just don't really pay attention to it, you know. ... what I'm doing or what it tastes like and it's not a really nice habit. ... I just kind of really kept going with it... (Participant 204, female, 50 years old, session 3)

I was thinking about the cigarette as I'm smoking it and... I know it's not good because it's messing with my body but my mind wasn't feeling that. ... I should not be enjoying this, this is what's hurting me. (Participant 202, female, 51 years old, session 4)

Similarity/Difference

Similarity/difference refers to how similar or different the ongoing experience of mindful smoking is compared to usual smoking. Theories on mindfulness do not typically address this construct. However, it is recognized as one crucial component in the inquiry process to reinforce experiential learning of mindfulness practice (Bowen et al., 2021; Crane et al., 2017). Themes included the expression of how different mindful smoking was from usual smoking with a quality of surprise and awareness of one's automatic behavioral pattern. Of note, the inquiry process facilitated building a clear contrast between what smoking used to be and how the current experience departs from it.

It was different in just like, I taste it really... I could taste it more, like the nastiness. ... you can taste whatever's inside the cig, like the different chemicals you can taste. (Participant 303, female, 44 years old, session 3)

... when I smoke I usually just smoke. But now I'm smoking and it ain't what it used to be. It ain't all that no more. (Participant 106, female, 58 years old, session 4)

... the first thing I do is light that cigarette while I'm waiting for that [pain] to subside or the burning sensation to subside, and I never thought about it before. (Participant 305, female, 61 years old, session 4)

The perceived difference between automatic versus mindful smoking seemed long lasting for the participants as reflected in the follow-up interviews.

... it was a different experience because it made me realize that I ... was smoking more like.. automatically. (Participant 204, female, 50 years old, follow-up interview)

... realizing that there was a big difference in sort of a perception that before I started smoking, and then when I was actually smoking. That the event was very different than what I expected. (Participant 302, male, 48 years old, follow-up interview)

Unpleasant/Pleasant Experience

Emotional response was categorized into *unpleasant and pleasant experiences*, each of which comprised three sub-codes: *overall experience* that does not include affect or physical sensations (e.g., dirty ashtray), *affect* (positive or negative), and *physical sensations* (e.g., smell, taste).

Of note, it was very common for participants to describe the unpleasant taste and smell they noticed during the mindful smoking exercise. Such noticing was often

followed by an expression of surprise and disgust. The quotes below convey some automaticity of smoking by which participants had been able to ignore unpleasant smell and taste, whereas the smoking experience was completely reshaped when they paid full attention to smoking.

I think I noticed in the mindful way that the cigarette tasted nasty. ... when I sat there and paid attention to it, the taste was horrible. (Participant 203, male, 53 years old, session 3)

It was like a dirty ashtray in my mouth. (Participant 304, male, 61 years old, session 3)

... the smoke was irritating, it was in my face, um, you know, the taste of it was really gross. (Participant 404, female, 53 years old, session 3)

Just because of this, I've opened a pack of cigarettes, smelled 'em, they don't have the same smell no more, the flavor is totally different, I don't like it. And of course the stink, it's just they, cigarettes always had a smell but not like now, they stink. And I can't stand when they go out if you don't keep puffing on 'em. That flavor when you relight that cigarette, it's like, sucking on a grill, the charcoal. (Participant 305, female, 61 years old, session 4)

... mindful smoking really sucked (laugh). (Participant 304, male, 61 years old, follow-up interview)

A small minority of participants reported some pleasantness while smoking mindfully.

I enjoyed those first couple puffs and watching the smoke in the air. (Participant 302, male, 48 years old, session 3)

It felt good. You know, I'm not gonna lie. ... when you're a little stressed out and you're breathing in and you're breathing out, and it feels like the cool air coming down your tongue. When you breathe, when you breathe out the smoke, just relax... (Participant 201, female, 54 years old, session 4)

Participants also noticed concurrent pleasant and unpleasant experiences.

This week it was a little bit more mixed. Um, I think I was focusing on the negative because I wanted to. There were positives whereas, ... I did get that relaxation feeling when I was a little antsy or a little stressed or, you know upset. It would give me that relaxation where I could focus on the matter at hand rather than having my thoughts scatterbrained. That part I think I did enjoy. I still don't like the taste anymore... (Participant 203, male, 53 years old, session 4)

In particular, one participant noted a sudden shift from pleasantness to unpleasantness, which repeated in session 4.

When I sat there with that fresh lit cigarette, I was very happy, I was very pleased. Uh, but being mindful and paying attention to it, by the time that I was about halfway through, the whole experience was really kind of getting gross. The cigarette looked nasty, you know, my hands were starting to smell. (Participant 302, male, 48 years old, session 3)

...each of my first cigarettes of the day, I did that to reinforce what we did the week before. I feel exactly the same way, that the beginning of a cigarette is still a very pleasant experience, but that pleasantness decreased pretty much right along with the length of the cigarette. As I got closer to the end, the less enjoyable it got, the more I was doing it just to finish... (Participant 302, male, 48 years old, session 4)

To summarize, many participants noted the unpleasant experience of smoking, mainly aversive smell and taste. An interesting observation included the mixed pleasant and unpleasant experiences, which seemed to shift as the cigarette was smoked. Notably, participants alluded to the potential importance of noticing the breath while smoking, as well as the physical sensation of relaxation. These observations are further discussed below.

Smoking Behavior

A few participants expressed acute changes in smoking behaviors and, more specifically, a decrease in smoking, primarily due to the unpleasantness accompanied with it or enhanced awareness of automatic behavior. We categorized them into acute (few minutes) or long-term change (next few days) following mindful smoking. Of note, no participant indicated acute or long-term increases in smoking.

I could taste the nastiness ... I just put the second cigarette out. I don't know, it is just like, it's making it worse, and you know, it just, it gets worse. (Participant 303, female, 44 years old, session 3)

The day is when I'm stressed, I just go, and I, that's autopilot. But even at night now, ... I've actually lit it, put it out, realized what I'm doing and I put it out. (Participant 305, female, 61 years old, session 4)

In both session 4 and during the follow-up interview, participants noted long-term decreases in smoking and, ultimately, quitting, due to mindful smoking. This code was a distinct code that emerged only in session 4 and the follow-up interview.

And, since I've been limiting the amount that I'm smoking per day, because I've already started to decline significantly, ... I've focused more on 'I don't need it even though I think I need it.' (Participant 106, female, 58 years old, session 4)

I think that [mindful smoking] might have been one of the more helpful things in my quitting. (Participant 302, male, 48 years old, follow-up interview)

These examples indicate that the learned experience from mindful smoking may affect cognitive-affective processes (e.g., decrease in the reinforcing value of smoking, awareness of automatic smoking and unpleasant properties), which in turn might aid in altering smoking behaviors both acutely and long term.

Desire to Smoke

A few participants noted a change in the desire to smoke based on what they noticed during mindful smoking. The theme centered around not wanting to continue smoking or no longer needing to smoke. In particular, many participants expressed decreased urge to smoke while mindfully smoking. On the other hand, it is also possible that mindful smoking might function as a positive reinforcer such that an individual becomes more aware of the pleasant properties of cigarette smoking, resulting in an increased desire to smoke.

When I was smoking it and everything, and I realized I don't really want this thing. (Participant 106, female, 58 years old, session 3)

I didn't want the rest of that cigarette. (Participant 302, male, 48 years old, session 3)

I noticed a lot of things about a cigarette. ... I don't need it as much as I think I do. (Participant 106, female, 58 years old, session 4)

Only one participant reported an increase in desire to smoke noting that mindful smoking was not helpful.

I wanted another one. ... It was something like my taste was like, my tongue started watering or tingling for another cigarette. (Participant 303, female, 44 years old, session 3)

Cognitive Reappraisal

Cognitive reappraisal is one proposed mechanism of mindfulness, which usually involves re-evaluating an emotionally challenging situation such that a new or different response may occur in the future (Gross & John, 2003). We differentiate cognitive reappraisal from decentering such that cognitive reappraisal pertains to the re-evaluation of a given situation, which, in turn, is linked to alternative behavioral strategies, whereas decentering was coded as the immediate observation of the present moment with distance. In other words, cognitive reappraisal is taking the observation of the present moment and applying that experience to behavior change. Interestingly, many participants shared that they reassessed their automatic smoking and developed

strategies to alter their smoking behavior by applying the lessons learned from mindful smoking to future smoking behavior or quit attempts. The major theme was brainstorming strategies to aid in quitting smoking by staying mindful while smoking or finding other rewarding healthy behaviors to substitute for smoking.

I think it might work because if I start to remember that [unpleasant] sensation, it might take away the want of having the cigarette. If I can make myself realize, okay I don't really need this and I don't really want this, I'm just doing this out of habit. ... I got to break it so when I want it I just got to find something to distract me until the feeling of want goes away, and then, you know, that'll become a habit. (Participant 106, female, 58 years old, session 3)

... going back to how I experienced my cigarette in two halves, I think if I focus on that second half as the cigarette smoking experience, I will focus more on the unpleasantness of it at the end. If I can start to associate that with smoking, uh, it could be a whole lot easier to fight those urges that [other participant] was talking about that are very real and very prevalent. (Participant 302, male, 48 years old, session 3)

... it reminds me that smoking ... affects my cardiovascular system, and will probably kill me. ... Saying to myself is a reminder, yeah, I better stop this or it's going to kill me. (Participant 402, male, 60 years old, session 3)

Now, I want to find something that's gonna be equally as good cause I still have the desire to quit so in my mind I had a hard time with it because during the time that I was smoking that was what was on my mind, was 'okay I feel this but can I feel this some other way.' (Participant 203, male, 53 years old, session 4)

Helpfulness/Usefulness

This code was only applied to the follow-up interviews, given that participants were retrospectively asked to consider what they thought about mindful smoking overall. Although 15 participants completed the follow-up interviews, only 11 were audio-recorded, transcribed, and coded (Supplementary Table 1). The 4 interviews in cohort 1 were not audio-recorded because IRB approval for recording was pending at the time of interviews. The majority of participants who completed the follow-up interviews reported that mindful smoking was helpful in pausing, noticing smoking triggers, and making a decision on whether or not to proceed with smoking. These reports are worth highlighting given the mindful smoking exercise was discussed only in session 3 and followed up briefly in session 4. After that, participants were encouraged to continue with mindful smoking until the

target quit date (session 5) without further proactive discussion around the topic. Among these 11 participants, 6 (55%) self-reported tobacco abstinence in the past 7 days (7-day point prevalence) at follow-up.

Well, actually that was a big help, because mindfully smoking really sucked (laugh). (Participant 304, male, 61 years old, follow-up interview)

... that really helped. Because I put it in my mind from the study that I can do the job and I can save some money, so that's what I've been doing. (Participant 401, male, 64 years old, follow-up interview)

... with the mindful smoking exercise, that really helped me to, you know, be aware as to why I was smoking... (Participant 405, female, 50 years old, follow-up interview)

Dynamic Presentation of Themes

Some participants articulated the dynamic interplay between theoretically relevant themes and cognitive, emotional, and behavioral themes. The following vignette demonstrates awareness of autopilot, unpleasant physical experience, and decentering with a quality of curiosity.

I tend to just smoke out of habit or because I've just eaten, or because I'm driving a car, or something that I always do as routine so the automatic pilot. But I noticed, like, while I was smoking and doing mindful smoking, how utterly disgusting it is and how it lingers in your mouth forever and the smell never goes away. And my mind kind of got wandering to, like, how did I ever start this and why. (Participant 106, female, 58 years old, session 3)

The following vignettes convey observation of unpleasant physical sensations that led to a shift in perspective (decentering) followed by awareness of the automatic pattern of smoking.

I think I noticed in the mindful way that the cigarette tasted nasty [laughs] it doesn't taste good to me. I don't know why I smoke; I'm questioning that because I do not like the taste as I noticed it more. I guess, when I smoke normally I don't pay attention to it, so, because I'm busy doing something else or I'm using it to distract me from something else but the taste, when I sat there and paid attention to it, the taste was horrible. (Participant 203, male, 53 years old, session 3)

My experience with mindful smoking, you know, something that's such a habit and, and you think you enjoy, really the taste of the cigarette is horrible. Uh, I thought that for the longest time, and watching it burn away and the smell of the smoke, the smell of the smoke on your clothing, uh, it was really not some-

thing I enjoyed. (Participant 304, male, 61 years old, session 3)

These examples highlight how behavioral and cognitive changes through mindful smoking can involve a complex interplay of several constructs that might be independently identified from the experience of mindful smoking, including participants' cognitive, affective, and behavioral reactions.

Discussion

Given its theoretical implications, the mindful smoking exercise has been included in multiple smoking cessation interventions (Brewer et al., 2011; Davis et al., 2014; Gifford et al., 2011). The current study addressed its utility through a qualitative analysis of participants' experience of mindful smoking during an 8-week telehealth group-based smoking cessation and alcohol modification trial. Our findings provide initial evidence on the role of mindful smoking in the process of cessation by showcasing themes that reflect theoretical constructs (attention/awareness, decentering, curiosity, nonjudgment/judgment, and similarity/difference) and cognitive, emotional, and behavioral responses (unpleasant/pleasant experience, smoking behavior, desire to smoke, cognitive reappraisal, and helpfulness/usefulness).

Consistent with the theoretical rationale of mindful smoking, our findings indicate that intentionally paying attention to one's smoking led to participants reporting an enhanced awareness of physical sensations and triggers as well as the automaticity of smoking. Paying attention in this way reflects a form of awareness that is nonevaluative in its nature without trying to achieve certain states (e.g., feeling good; Brown & Ryan, 2003). Our findings suggest that mindful smoking is likely to maximize the salience of automatic smoking. Contrary to our expectation, curiosity and nonjudgment were rarely noted. Given that mindful smoking was practiced during the early phase of the treatment and only for 2 weeks before the quit date, it is likely that the ability to curiously observe ongoing experience nonjudgmentally and with acceptance may develop after additional mindfulness practice (Baer et al., 2004; Gu et al., 2016).

One notable finding was the experience of unpleasant taste and smell. This is aligned with, to the best of our knowledge, the only peer-reviewed published information on participant response to mindful smoking, which was the aversive smell and taste of smoking ("smells like stinky cheese and tastes like chemicals. YUCK"; Brewer, 2019, p. 201). Automatic smoking is likely to impede or mask unpleasant physical sensations and experiences associated with smoking. "Absentminded" automatic smoking supports such a hypothesis in that cognitive processing is

not activated once smoking becomes automatic (Tiffany, 1990). Interestingly, emotional reactions took place in conjunction with the emergence of various theoretical themes, suggesting the experiential utility of mindful smoking in potentially changing one's relation to smoking. This process is also noted in the decentering and cognitive reappraisal processes that were observed. Along with emotional reactions, decreases in short- and long-term smoking behavior and desire to smoke were noted, supporting the link between cognitive, emotional, and behavioral responses. Notably, mindful smoking appears to have facilitated the process of developing new memories on the relation to smoking as reflected in the perceived helpfulness and usefulness discussed during the follow-up interview. However, the findings on the helpfulness/usefulness code warrant caution, as 55% of the 11 participants who completed the follow-up interview self-reported tobacco abstinence.

The evidence on the experiential utility of mindful smoking is broadly aligned with an emerging literature that puts an emphasis on shifting the intervention focus from discussing, analyzing, and thinking about unhelpful behaviors/thought content (as in a traditional cognitive behavior treatment approach) to experientially approaching one's relationship with such experiences (Hofmann & Hayes, 2019). For example, exposure to typically avoided experiences (e.g., negative affect) might be facilitated by simply inviting an individual to let the avoided experience be present and to bring awareness to avoidant tendencies (Selchen et al., 2018). Thus, as opposed to thinking, analyzing, and problem solving, participants are invited into an experiential exercise such that they can be actively aware of thoughts, feelings, and physical sensations by shifting attention from "talking/thinking about" to "being present with" (Crane et al., 2010).

One might raise a question as to what could happen if mindful smoking is experienced as pleasant to someone, as was observed among a small portion of participants. It is possible that mindful smoking might be less beneficial in such case. Mindfulness teaches one to bring awareness to whatever experience is entering in the field of awareness, whether positive or negative. Thus, one's task during mindful smoking is paying attention to both pleasant and unpleasant experiences while smoking a cigarette without reacting to them, acknowledging that two very different experiences can occur. Further, noticing the pleasant experience of smoking provides an opportunity for one to explore how they could obtain similar enjoyment from activities that are not smoking a cigarette, which was evident from the quotes above. Such discussion may need to be initiated by the facilitator. Nevertheless, potential unhelpful consequences of mindful smoking (e.g., increased smoking) should be empirically examined.

Our findings are aligned with one of the core implications of cognitive processing theory in that bringing conscious

awareness to the automaticity of smoking can break that automatic loop and inhibit automatic smoking by consolidating new memory on the relation to smoking (Tiffany, 1990). Our participants expressed surprise in learning about their automatic smoking pattern and how unaware they were of the unpleasant aspects of smoking. In other words, their expectation that smoking would be pleasant was violated, resulting in a cascade of cognitive-emotional-behavioral changes and, likely, the inhibition of automatic smoking, consistent with the theoretical rationale of exposure and extinction processes (Craske et al., 2018). Notably, the inquiry process led by the facilitator appears to reinforce new learning by building a clear contrast between usual and mindful smoking as proposed in the literature (Crane et al., 2017).

Limitations and Future Research

Some limitations should be noted. First, the mindful smoking exercise was conducted in the early phase of treatment for only 2 weeks. Thus, our findings are limited to the relatively short-term practice of mindful smoking among individuals with less experience in mindfulness. Future research is needed to determine if awareness is sustained and/or deepened with enhanced nonjudgment through the long-term practice of mindfulness and/or whether long-term mindful smoking is beneficial (e.g., pre-quit and following quit date when relapse occurs; Horvath et al., 2021). Mindful smoking over an extended period of time may generate rich themes including how mindful smoking would be used when relapse occurs after quitting. It would be also interesting to examine the role of trait/state mindfulness on the quality of engagement in mindful smoking and how this might impact subsequent smoking/alcohol behaviors. Second, no formal interview was conducted to assess participants' perception of mindful smoking aside from one question asked during the follow-up interview. Given we were assessing one aspect of the entire intervention through this question, we believe that a single question was sufficient when combined with participants' experience immediately following mindful smoking in sessions 3 and 4. However, future studies should examine the experience of mindful smoking in a more structured way by providing ample time to discuss their experiences and by conducting a semi-structured qualitative interview post-mindful smoking. Further, ensuring that participants engage in mindful smoking in an intentional way may require the facilitator to pose more specific questions during inquiry (e.g., how did you use curiosity during mindful smoking?). It is possible that such techniques (e.g., using curiosity as a means) were being used, but that participants did not bring it up, or that there was confusion around this component of mindfulness. More direct discussion may have also revealed that perhaps curiosity was not an essential component of

mindful smoking. Future research with an appropriate study design could answer such questions.

Third, current findings may not be generalizable to other smoking populations (e.g., intermittent smokers; smokers not enrolled in cessation treatment; smokers with binge drinking). Some unique features of the current study (i.e., delivered via telehealth, provision of a tablet with a camera and data plan) may limit the generalizability of the findings if mindful smoking is conducted in-person or among individuals with limited access to mobile devices and internet. Individuals who smoke daily and who use alcohol heavily, as in our sample, might report experiences (e.g., alcohol craving/use as a smoking trigger) different from smokers who do not drink. It is also possible that mindful smoking may have prompted participants to apply mindfulness to their alcohol use, which may have impacted their perceived helpfulness/usefulness of mindful smoking. Future research should consider this possibility through inquiries (e.g., Did you ever use the lessons learned from mindful smoking while drinking alcohol?) and measurement of its effect. Fourth, the current study conducted a secondary analysis of the original data and it is possible that thematic saturation was not met. Further, other factors that we were unable to easily quantify could have impacted verbal participation following mindful smoking (e.g., various group cohesion factors that were not measured).

Several additional opportunities for future research should be noted. For example, studies may want to examine if manipulating the mindful smoking instructions (e.g., mere observation vs promoting awareness with nonjudgment and acceptance) leads to various changes in smoking behavior such as reductions in cigarettes smoked per day or abstinence. Further, it is unclear whether the inquiry process, led by the facilitator, is a key factor in bringing awareness to the mindful smoking practice. Relatedly, mindful smoking versus didactic teaching of the adverse consequences of smoking might result in a differential impact on smoking outcomes. Finally, the association of mindful smoking and changes in various existing cognitive-affective measures (e.g., craving, cigarette demand, cognitive bias) would further support the utility of mindful smoking. In sum, testing these various components of mindful smoking might aid in developing more efficacious interventions.

The utility of mindful smoking has not been tested, although it has been included in various mindfulness-based smoking cessation treatments. Our findings provide initial evidence on the theoretical implications and potential cognitive, affective, and behavioral mechanisms underlying mindful smoking. Mindful smoking appears to be an effective way for participants to become more aware of their smoking behaviors, such that this awareness could contribute to the ultimate goal of smoking cessation.

Author Contribution MJY: collaborated in the designing of the study, analyzed the data, and wrote the paper. DK: collaborated in the designing of the study and the editing of the final manuscript and analyzed the data. KW: collaborated in the editing of the final manuscript. MU: collaborated in the editing of the final manuscript. SB: collaborated in the curating of the data and the editing of the final manuscript. DW: collaborated in the editing of the final manuscript. CV: designed and executed the study, analyzed the data, and collaborated in the writing and editing of the final manuscript. All authors approved the final version of the manuscript for submission.

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Data, Materials, and Code Availability Statement Data, materials, and code will be available upon reasonable request. Raw verbatim data will not be available for ethical reasons.

Declarations

Ethics Approval The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. The current study was approved by the Advarra Institutional Review Board (Protocol number: 19630).

Consent to Participate Informed consent was obtained from all individual participants included in the study.

Conflict of Interest The authors declare no competing interests.

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