Original Paper

Chinese Smokers' Perspectives on Smoking Cessation Apps: Qualitative Descriptive Study

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Abstract

Background: Tobacco use remains a major global public health challenge, with a disproportionate burden in low- and middle-income countries. China, with the largest smoking population worldwide, faces additional challenges in smoking cessation due to sociocultural factors such as limited depth of risk awareness and strong social norms supporting smoking. Mobile health (mHealth) interventions, particularly smoking cessation apps, offer scalable and accessible support for behavior change. Limited qualitative research explores how Chinese smokers perceive smoking cessation apps and their roles in supporting quitting.

Objective: This study aims to explore Chinese smokers' experience of using smoking cessation apps to support smoking cessation.

Methods: Chinese smokers with experience using smoking cessation apps were recruited via purposive sampling through social media. In total, 24 semistructured interviews were conducted online in Mandarin, audio-recorded, and transcribed verbatim. Interview questions explored participants' experiences of using smoking cessation apps, including their perceptions of different app features, factors influencing their engagement, and how these features supported or hindered their quit attempts. Qualitative analysis was conducted to identify themes related to participants' experiences regarding smoking cessation apps.

Results: Ten themes were identified through qualitative analysis. Smoking cessation apps were perceived as most effective for users who were motivated to quit and believed in the usefulness of the apps. Features such as progress tracking and feedback enhanced extrinsic motivation and self-efficacy, with potential to foster intrinsic motivation over time. However, engagement with apps could decrease as users became more confident in maintaining abstinence. Social support functions provided emotional and informational support, and interactions with other quitters generated positive competition, particularly for users experiencing social isolation, although engagement with these features varied. Relapse prevention components, such as withdrawal symptoms education and recording features, were infrequently used when support was perceived as generic, low intensity, or insufficiently actionable. Good usability and user experience design were key drivers of sustained engagement. Participants valued apps that were simple and intuitive while offering different content formats, although preferences varied between users. Participants also described generic and nonpersonalized support as a limitation, despite rarely explicitly requesting greater personalization.

Conclusions: Smoking cessation apps may support quitting through multiple mechanisms, including enhancing motivation and self-efficacy and facilitating social support, but their perceived value and use depend on users' needs, beliefs, and contexts. The findings highlight broader considerations for mHealth intervention design and evaluation, including interpreting engagement in relation to changing support needs, recognizing that social features may generate additional motivational mechanisms through peer interaction, providing actionable and responsive behavioral support, accommodating diverse user preferences while maintaining usability, and using co-design to identify underlying user needs that may not be explicitly articulated. These considerations may inform the development of more responsive and user-centered mHealth interventions for smoking cessation and other behavior change contexts.

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KEYWORDS

mHealth; mobile health; digital health; smoking cessation; mobile apps; qualitative research

Introduction

Tobacco use remains a major global public health challenge, with more than 7 million people killed by smoking each year [1]. Importantly, more than 80% of the world's 1.3 billion tobacco users reside in low- and middle-income countries, where the burden of tobacco-related morbidity and mortality is disproportionately concentrated [1]. China, as a middle-income country and the largest consumer of tobacco globally, has over 300 million smokers, representing nearly one-third of the world's total smoking population [2]. This makes China a critical setting for tobacco control and smoking cessation efforts, with significant implications for global public health.

In recent decades, the Chinese government has strengthened tobacco control efforts [3,4]. China ratified the World Health Organization Framework Convention on Tobacco Control in 2005 and has since implemented a range of measures, including tobacco taxation, restrictions on tobacco advertising, smoke-free policies, and health warnings on cigarette packaging [3]. In addition, smoking cessation services have also been developed, including a smoking cessation clinic, a national quit-line, the clinical smoking cessation guideline, and the integration of evidence-based cessation support into medical education [5]. However, the uptake of smoking cessation services in China remains limited [6], with only 5% of smokers reported to have used quit-lines, smoking cessation medications, or attending clinics by 2018 [4]. Similarly, the 2018 China Adult Tobacco Survey found that, among people who had attempted to quit smoking in the previous 12 months, 90.1% did not use any cessation method, while 4.6% used medication and 3.2% received cessation counseling [7]. E-cigarette use has also increased in China, particularly among the young male population. In 2018, 5% of people aged 15 years and older had ever used e-cigarettes, and 0.9% were current users [7]. Notably, smoking cessation was the most reported reason for e-cigarette use, although evidence for their effectiveness in supporting smoking cessation remained unclear [8].

Beyond the limited uptake of available cessation support, smoking cessation in China presents additional challenges due to distinct sociocultural contexts [9]. Although awareness of the harms of smoking is relatively high, important gaps remain in knowledge of specific smoking-related diseases. The 2018 China Adult Tobacco Survey found that 86% of adults believed that smoking could cause serious diseases, and 82.8% were aware of its association with lung cancer. However, awareness was substantially lower for other smoking-related conditions, with only 50.8% recognizing the association with heart disease, 41.4% with stroke, and 26% with erectile dysfunction [7]. Furthermore, traditional Chinese smoking culture plays a significant role in sustaining smoking behavior [9]. Practices such as cigarette sharing and gifting are embedded in social interactions and are often used to express courtesy, build relationships, and maintain social harmony [9,10]. In addition, smoking is closely linked to masculinity norms and collectivist values, where refusing cigarettes may be perceived as socially inappropriate or as deviating from group expectations [11,12]. These cultural dynamics create strong social pressures that can hinder quit attempts and contribute to relapse.

These challenges highlight the continuing need for accessible and effective approaches to support smoking cessation in China. Mobile health (mHealth) interventions, particularly smoking cessation apps, have emerged as promising tools to support behavior change. A recent systematic review and meta-analysis including 31 studies found that smartphone apps used alone may improve 6-month continuous abstinence compared with no or minimal support (risk ratio [RR] 2.85, 95% CI 1.61-5.05; evidence from 4 studies, n=1402). When combined with traditional interventions, smartphone apps may also improve 6-month continuous abstinence compared with traditional interventions alone (RR 1.98, 95% CI 1.24-3.16; evidence from 4 studies, n=2163) [13]. A systematic review of digital smoking cessation interventions in Asian countries, including 25 studies and 22,005 participants across 9 countries, also reported promising outcomes. Abstinence rates of up to 60% were reported for smartphone app interventions [14]. With the widespread use of smartphones, these apps offer opportunities to provide accessible, cost-effective, and personalized support at scale [15,16]. Smoking cessation apps are designed to provide users with a supportive and user-friendly environment to help smokers quit smoking. Apps with good usability can ensure that users can access app functions and resources easily without encountering complex interfaces or operations [17,18]. These apps can support smoking cessation by offering social support, virtual rewards, positive feedback, and personalized support while addressing users' privacy concerns. Together, these features may enhance motivation to quit smoking and increase user engagement [19]. In addition, smoking cessation apps can deliver real-time assistance, enhance anonymity, and incorporate interactive features such as social support, feedback mechanisms, and personalized recommendations [20,21]. However, despite their potential, smoking cessation apps also face important limitations. Challenges include the digital divide, variable app quality, high attrition rates, usability issues, and concerns regarding privacy and data security [22-24].

As such, a clearer understanding of how these apps influence smoking behavior, as well as how they can be designed to better meet users' needs and align with specific sociocultural contexts, is essential. Therefore, gaining insights from Chinese smokers who have used smoking cessation apps before is critical to inform the development of more effective and context-sensitive interventions. However, there is a lack of qualitative research examining how Chinese smokers perceive the barriers to smoking cessation in China and the potential role of smoking cessation apps in addressing these challenges to support smoking cessation. Therefore, this study aims to explore Chinese smokers' perspectives of using smoking cessation apps to

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support smoking cessation. The research question is "What are Chinese smokers' perspectives of using smoking cessation apps to help them stop smoking?"

Methods

Study Design and Setting

The interview study was conducted as part of a broader doctoral project [25]. In this paper, we report a qualitative descriptive analysis of the interview data designed to answer the research question [26,27]. The study was led by MZ, a researcher with a background in nursing and digital health and formal training and experience in qualitative research. MZ was responsible for study design, data collection, and data analysis. The wider research team included researchers with complementary expertise in health behavior and qualitative research (LD and CC) and human-computer interaction (MW). Interviews with smokers were conducted online through phone calls via WeChat between May 2022 and January 2023 due to COVID-19 restrictions. The reporting of this study was guided by the SRQR (Standards for Reporting Qualitative Research) [28].

Participants and sampling

Participants were recruited using a purposive sampling strategy. Smokers were recruited through advertisements posted on the major Chinese social media platform (The Red Book). To be eligible, participants were required to be adult Chinese smokers who had experience using smoking cessation apps. Smokers were excluded if they did not use smoking cessation apps or were younger than 18 years of age. Past or concurrent use of other smoking cessation aids, including pharmacological and nonpharmacological approaches and e-cigarettes, was not an exclusion criterion. As this study formed part of a broader doctoral project exploring how smoking cessation apps help Chinese smokers stop smoking [25], the interviews focused primarily on participants' experiences of using smoking cessation apps, and the use of other smoking cessation aids was not systematically explored. Interested participants were provided with an information sheet detailing the study aims and procedures, and informed consent was obtained prior to participation.

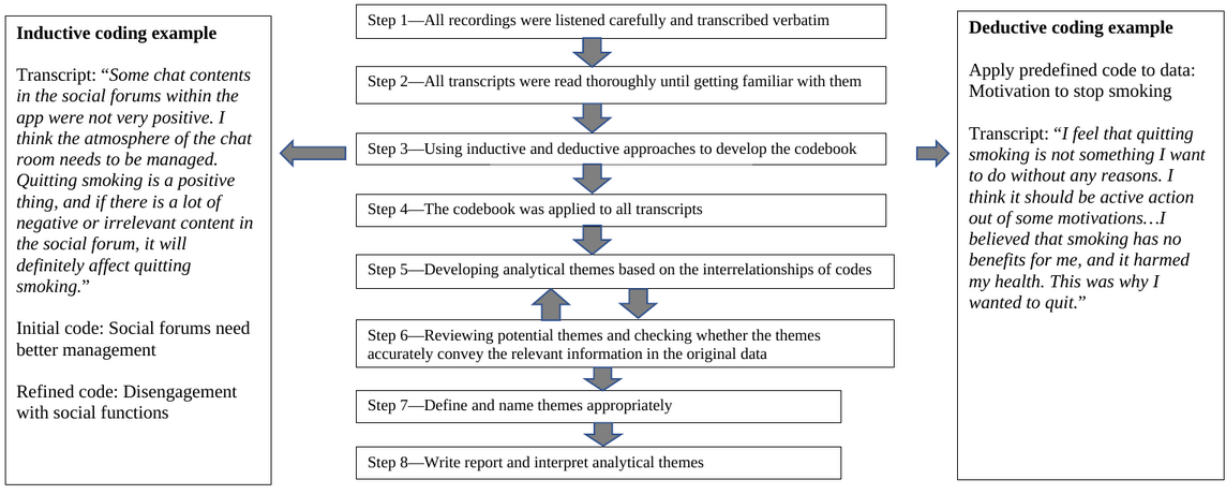
Data Collection

Data were collected through semistructured interviews with Chinese smokers. The interview guide was informed by insights from prior systematic reviews and findings from interviews with Chinese health care professionals and was designed to explore perceptions, experiences, and expectations regarding smoking cessation apps and their potential roles in supporting smoking cessation [19,25] (Multimedia Appendix 1). All interviews were conducted in Mandarin and audio-recorded using an encrypted device. Interviews were transcribed verbatim by MZ. All audio recordings were deleted once transcription was completed.

Data Analysis

Qualitative analysis was conducted to identify patterns related to participants' experiences of using smoking cessation apps [26]. Analysis followed a combined inductive and deductive approach. Deductive coding was informed by findings in earlier phases of the study [19,29], while inductive coding allowed new themes to be identified from the data (Figure 1).

Figure 1. Qualitative analysis process.



NVivo software (QSR International) was used to support data management and coding [30]. Notably, the coding process was conducted based on the original Chinese transcripts. This was to avoid a lack of comprehensive understanding or misinterpretation of the participants' genuine meanings [31,32]. To enhance analytical rigor, human-computer interaction–related data (eg, usability and user experience) were independently reviewed by a researcher with expertise in human-computer interaction (Duncan Reid). Two interview transcripts were coded by MZ and another researcher with a nursing background and checked for consistency (Xiaoyang Li). As coding was conducted based on Chinese transcripts, English versions of selected transcripts and the codebook were shared with the research team for review, and any discrepancies were discussed and resolved through team meetings. Figure 1 shows the detailed data analysis process.

Ethical Considerations

Ethics approval was obtained from the School of Health in Social Science Research Ethics Committee at the University of

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Edinburgh (CHASS2110/02). Approval covered all relevant research details, including recruitment approaches, informed consent, privacy and confidentiality, data collection, and data protection. Before participation, all participants received an electronic participant information sheet in Chinese explaining the purpose and procedures of the study, their rights as participants, and relevant information regarding participation. Participants were given the opportunity to ask questions or raise concerns before deciding whether to participate. Written informed consent was obtained electronically from each participant before the interviews were scheduled and conducted. Audio recordings of the interviews were made using an encrypted recorder and securely stored on a password-protected University of Edinburgh OneDrive account. Audio recordings were permanently deleted after transcription was completed. All interview data were anonymized to protect participants' privacy and confidentiality. No incentives or financial compensation were provided to participants for taking part in the study.

Results

Participant Characteristics

A total of 24 Chinese smokers participated in the study. Participant characteristics are shown in Table 1.

Table 1. Participant characteristics.

Characteristics	Values (N=24)
Age (years), mean (SD)	28.83 (5.63)
Sex, n (%)	
Male	19 (79.2)
Female	5 (20.8)
Education, n (%)	
High school	2 (8.3)
College diploma	8 (33.3)
Bachelor's degree	11 (45.8)
Master's degree	3 (12.5)
Employment, n (%)	
Employed	24 (100)
Unemployed	0 (0)
Smoking cessation apps, n (%)	
Smoking Cessation Army	17 (70.8)
iHabit	1 (4.2)
3 Krystal Smoking Cessation	1 (4.2)
No Tobacco	2 (8.3)
Quit Smoking Tool	1 (4.2)
Quit Smoking	1 (4.2)
Smoking Cessation Expert	1 (4.2)

Smokers' Perspectives on Smoking Cessation Apps

Overview

Ten themes were generated through the qualitative analysis (Textbox 1).

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Textbox 1. Themes and subthemes of smokers' perspectives on smoking cessation apps.

Theme 1: motivation to stop smoking
- Subtheme 1.1: extrinsic motivation
- Subtheme 1.2: intrinsic motivation
- Subtheme 1.3: transformation from extrinsic motivation to intrinsic motivation

Theme 2: perceived usefulness

Theme 3: self-efficacy

Theme 4: social isolation
- Subtheme 4.1: social stigma
- Subtheme 4.2: lack of support from people in real life

Theme 5: social support
- Subtheme 5.1: emotional support
- Subtheme 5.2: informational support
- Subtheme 5.3: sense of healthy competition

Theme 6: disengagement with social functions

Theme 7: education on withdrawal symptoms

Theme 8: withdrawal symptoms recording

Theme 9: usability
- Subtheme 9.1: ease of use
- Subtheme 9.2: multiple modalities
- Subtheme 9.3: visual design

Theme 10: user experience
- Subtheme 10.1: user privacy
- Subtheme 10.2: record keeping
- Subtheme 10.3: advertising and membership fees
- Subtheme 10.4: gamification
- Subtheme 10.5: personalization

Motivation to Stop Smoking

Overview

Motivation to stop smoking relates to both the driving force that pushes smokers to change their smoking behavior and the strengthening of their desire to do so. It can be intrinsic or extrinsic, which reflects the origins of the desire to change smoking behavior [33]. Intrinsic motivation refers to the internal forces behind individuals' behaviors [34], such as the consideration of health. Conversely, extrinsic motivation comes from external factors, such as rewards and short-term goals [33].

Interview data showed that having motivation, intrinsically or extrinsically, is a prerequisite for successful smoking cessation and relapse prevention because motivation directly affects smokers' decision-making and behaviors.

> *I feel that quitting smoking is not something I want to do without any reasons. I think it should be active action out of some motivations...I believed that smoking has no benefits for me, and it harmed my health. This was why I wanted to quit.* [Participant 22, male]

On the contrary, a participant emphasized that apps would have a counterproductive effect on smokers who lacked sufficient motivation to stop smoking or decided to quit due to external pressures.

> *Indeed, for a smoker who doesn't seem very motivated to quit and may have hesitations or is being pressured by family and friends to quit, it's a different situation. They may lack self-discipline and may inherently resist the idea of quitting. They might feel unsure of their ability to succeed and may even find the idea of quitting unpleasant. Constant reminders to quit can be irritating.* [Participant 16, female]

Extrinsic Motivation

Smoking cessation apps use a range of strategies to enhance smokers' extrinsic motivation. For example, many apps include

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a daily "check-in" feature that allows users to log their smoke-free days. Tracking abstinence days serves as a visible record of users' prior efforts in quitting smoking. This not only reinforces their sense of achievement but also increases their reluctance to relapse, as they are reminded of the time and effort already invested in cessation. In addition, based on these records, the apps provide feedback on health recovery (eg, improvements in blood oxygen levels) and display the financial savings achieved, which serves as a reward mechanism for the smokers' achievements in maintaining abstinence, thus reinforcing their motivation externally.

> *Once you start using the app, if you relapse, you'll lose all the progress you've made up to that point, and that would be a shame...making you think twice about the cost of relapse.* [Participant 11, male]

Intrinsic Motivation

Intrinsic motivation arises when smokers realize that smoking cessation has profound benefits for themselves, allowing them to stay abstinent even in the absence of external rewards [34]. Most smoking cessation apps primarily enhance intrinsic motivation by fostering health awareness [35], for example, smoking cessation apps could provide information about the health risks of smoking and the benefits of smoking cessation to help motivate smokers to quit. This study found that smokers are often benefit-oriented in the context of smoking cessation. Compared with the risks of smoking, which may not be personally experienced by smokers, the benefits of smoking cessation can be displayed explicitly within apps to make smokers more aware of these benefits. When apps provide information on the positive changes happening in their bodies, smokers tend to believe in these positive changes.

> *It (health recovery overview) will have an average value, which is not accurate, to be honest. But it's quite enjoyable just looking at it, very exciting.* [Participant 8, female]

However, compared with benefits, providing negative stimuli, such as the risks of smoking, is not so effective. The addictive nature of nicotine and the pleasure derived from smoking make it hard to stop smoking. Smokers may also underestimate the severity of the health risks associated with smoking, believing that they are unlikely to experience adverse health consequences because they consider themselves lucky.

> *No matter how terrifying the consequences of smoking are, they can't compare to the terror of being without cigarettes during moments of craving. That's why it's important to discuss the benefits of quitting smoking...I derive a lot of happiness and joy from smoking. Why quit smoking? I have not experienced health issues from smoking and the absence of cigarettes would make me feel worse, right?* [Participant 2, male]

Transformation From Extrinsic Motivation to Intrinsic Motivation

Extrinsic motivation increases when viewing clear indicators of quitting progress, such as the number of abstinence days and the money saved. This makes smokers feel that quitting smoking is meaningful and that their efforts have paid off. When extrinsic motivation is integrated into an individual's internal values, it can be transformed into intrinsic motivation.

> *I feel like I'm quitting smoking for my own health. It (showing the abstinence days) reminds me that my body is getting better and better makes me so happy.* [Participant 14, female]

Perceived Usefulness

Perceived usefulness is crucial for the app to achieve its intended effects. If users believe that the app can provide them with the necessary support and resources to help them quit smoking, they are more likely to actively engage with the app, thereby allowing it to have the greatest impact. Conversely, smokers who hold the belief that the success of smoking cessation solely depends on their own efforts and doubt the effects of smoking cessation apps think that some user engagement could have counterproductive effects, for example, to trigger anxiety or cravings.

> *Smoking cessation mainly relies on personal determination and persistence. This smoking cessation app, I feel that it just serves as a tool to record abstinence days.* [Participant 15, male]

> *The existence of a smoking cessation app is a terrible thing because quitting smoking is about weakening the concept of time, yet it keeps reminding you how long you have quit...If the app keeps reminding me of the number of days of smoking cessation, it actually makes me feel anxious, you know? Because it's a reminder that I've gone 60 days without nicotine, and it can be uncomfortable.* [Participant 14, female]

Self-Efficacy

Self-efficacy refers to an individual's belief in his own ability to achieve specific goals, and it reflects his confidence in his ability to take control over his behaviors [36]. Self-efficacy influences the smoking cessation goals set by smokers and their ability to adhere to achieving these goals. When their self-efficacy is higher, they are likely to set higher goals and firmly believe that they can achieve these goals. Smoking cessation apps use a lot of strategies to make users believe that they are capable of succeeding in smoking cessation, including recording quitting progress and showing them the benefits they have accumulated since their smoking cessation journey started.

> *Having those real records and realizing that I've managed to be abstinent for such a long time, gives me the belief that I can continue to do so in the future.* [Participant 10, male]

As self-efficacy increases, smokers become more confident in their personal abilities to continue smoking cessation and rely less on apps. Interview data showed that app engagement will decrease when smokers believe in their own capabilities to cope with challenges in smoking cessation.

> *I stop checking-in long time ago. From the six-month of smoking cessation, I no longer felt the need to do so. I thought checking in was wasting time, and now*

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I don't need the app to tell me how many days I've been smoke-free. [Participant 22, male]

Social Isolation

Overview

In the context of smoking cessation, social isolation refers to smokers having minimal social connections with others, leading to feelings of loneliness, which can negatively affect smokers' psychological or mental health [37].

Social Stigma

Some smokers may feel isolated from people around them in real life because of negative judgments by society toward smoking. Social stigma can manifest as discrimination against smokers since they are perceived as lacking self-discipline, irresponsible, and should be responsible for their bad health.

Some people would think of me as someone who does not take good care of my health, and also regard me as a person without self-control and lacking discipline. [Participant 13, male]

In traditional Chinese culture, female smoking is considered to go against social norms because smoking is generally viewed as a behavior that does not align with traditional female roles, such as caring for children and doing housework [38]. The different social expectations and roles among male and female populations can make female smokers face greater pressure and moral condemnation from people around them.

Other people may have a bias towards me because of smoking. Although society is quite tolerant nowadays, they still tend to believe that it is not good for females to smoke. [Participant 5, female]

Lack of Support From People in Real Life

When smokers decide to quit smoking, they may encounter a lack of support from nonsmokers around them in real life. One of the reasons might be that nonsmokers do not understand the addictive nature of smoking and how much determination and courage it takes to make the decision of smoking cessation. Another reason might be that people around smokers may doubt their abilities to achieve smoking cessation due to their past failed experiences.

When I first told my friends that I was going to quit smoking, they were doubtful about this decision. They would say, "have you really decided to quit smoking? You are just making a joke, aren't you?" [Participant 22, male]

In addition, the smoking culture in China may pose a barrier to smoking cessation, as individuals who attempt to quit often encounter resistance within their social environments. Interview data indicated that when a member of a social group decides to stop smoking, their intention may not be taken seriously by peers, who may continue to offer cigarettes. Furthermore, as offering cigarettes is a widely accepted social practice in China, individuals attempting to quit may feel excluded from social interactions where smoking is embedded, thereby exacerbating feelings of social isolation.

In a social situation where everyone is smoking except for me, they would ask me why I did not smoke and whether it is because I did not want to be with them. [Participant 13, male]

Social Support

Overview

Smoking cessation is a challenging endeavor, in which social support can increase the possibility of achieving goals [39,40]. If smokers experience stigma and social isolation in real life, social support features in apps may provide a platform for them to receive support, empathy, and encouragement and share smoking cessation experiences.

Emotional Support

Throughout the smoking cessation process, having like-minded peers showing empathy and understanding and having shared goals play vital roles. Smokers attempting to quit may need to actively seek emotional support from people who can fully understand their challenges of quitting smoking. Interview data showed that in smoking cessation groups within apps in which many smokers are situated in similar quitting stages with similar smoking cessation goals, smokers start to feel that they are not fighting the smoking cessation battle alone. The expression of empathy made smokers feel that their feelings were understood, therefore creating a powerful network of emotional support.

The meaning of the social function of the app is that users can quit smoking together so they will not feel lonely. They are not fighting alone. [Participant 17, male]

When I see the difficulties that other users encountered when quitting smoking, I can understand their feelings. It's possible that the difficulties they talked about were the ones that I was experiencing myself. [Participant 18, male]

Informational Support

Another format of social support that smoking cessation apps provide is informational support from both successful and failed experiences of other app users. Participants reported that viewing others' success in quitting smoking for a long time boosted their confidence to stop smoking. Successful quitters could act as role models by encouraging others to follow in their footsteps. In addition, they can also become vigilant to relapse when they read the failed experiences of others.

I think both successful and failed experiences have certain effects. When I saw others succeed, it made me think that I could succeed, too. When I saw someone failed because of relapse, I would also read what they said about the reasons of relapse, then alerted myself to avoid doing the same things. [Participant 10, male]

Successful quitters may act as "missionaries" in the social forum by believing that they have a responsibility to help other quitters overcome challenges by sharing their own experiences and tips. Sharing their experiences of successfully quitting smoking not only provides informational support to smokers who are

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struggling to quit but also reinforces successful quitters' confidence in maintaining their smoking abstinence.

> *Successful quitters would also share some of the tips of smoking cessation within the social forum. At the same time, they would cheer us up to keep on going in smoking cessation. He has succeeded and he also wanted us to succeed as well.* [Participant 13, male]

The experience of those who have relapsed can also be used as a valuable resource to help smokers realize that relapse could be a normal part of breaking the addiction cycle and to remind quitters to remain vigilant of relapse even after a long period of abstinence. In addition, the regrets of those who have relapsed can also make other users more determined to maintain abstinence to avoid similar regrets.

> *Some people relapsed, and they reported why they relapsed this time in the social forum. I can feel their regrets and misery in their words and think that I would experience the same if I relapsed. This will make me more determined to stay abstinent.* [Participant 4, male]

Sense of Healthy Competition

In a group where everyone shared a collective endeavor, such as smoking cessation, it could automatically stimulate an underlying sense of competition. It might be because people tend to seek recognition in a socialized environment, and the social forums provide a platform for them to share achievements. Furthermore, the existence of an underlying competition motivated smokers to maintain their abstinence status to surpass other quitters.

> *Some people relapsed, and it made me think if I can resist cravings while other people relapsed ... I feel pretty good about myself for being able to persist quitting smoking.* [Participant 12, female]

Disengagement With Social Functions

Although most participants liked the social features within apps, some participants reported that they seldom use the social forums within apps. Those smokers who strongly believed that smoking cessation is a personal and private issue were likely to engage less with the social features.

> *It is impossible to rely on others to help quit smoking. Quitting has to be accomplished through your own efforts.* [Participant 8, female]

Smokers who prefer to face and address challenges alone rather than seeking social support resisted the social components within apps. For these smokers, seeking social support in a smoking cessation app may seem like a waste of time and irrelevant to quitting smoking.

> *I haven't really explored the social forum because I feel like I don't need it.* [Participant 7, male]

Interview data also showed that another issue that will lead to disengagement with social features is the poor management and regulation of these platforms. Better regulation of these social features is needed to maintain a positive and safe social space within apps, thereby enabling users to gain more social support from the social components.

> *My experience of using this app could even be better if it has improved social forum management. For example, functions like blacklisting someone who bullies others could decrease the influence of negative comments.* [Participant 5, female]

Education on Withdrawal Symptoms

Uncertainty regarding what withdrawal symptoms will happen and why they happen can cause anxiety during smoking cessation [41]. Interview data showed that apps providing smokers with educational information about withdrawal symptoms, such as what the symptoms are, the reasons why these symptoms occur, and how long they will last, can reduce anxiety.

> *I checked the withdrawal symptoms in the app and found that my oral ulcers were likely caused by quitting smoking. The app explained that the occurrence of oral ulcers is due to the change in chemical substances in my body, as nicotine in the blood decreases, so I did not worry too much about it. It was possible that the body might have certain reactions.* [Participant 23, male]

Having cravings is the most prevalent and influential withdrawal symptom found by this study. Although apps provide tips on how to manage cravings (eg, they suggest tips like exercise or holding breath), interview data showed that not many smokers engage with this feature frequently. The reason might be the low intensity of the provided support. Participants highlighted that apps provided general information that lacked personalization and further instruction. For example, when apps provided tips, they only provided textual information on the strategies to manage cravings but lacked further guidance to push smokers to implement these strategies in practice. App developers could consider providing multifaceted resources within apps that align with the provided advice, such as providing a set of videos on exercise that can be chosen by smokers, thereby providing more actionable support beyond textual information.

> *I just read the tips to control cravings in the early stages of smoking cessation, but I did not find them particularly useful because they mostly consisted of information I already knew. They were common knowledge to me.* [Participant 7, male]

Withdrawal Symptoms Recording

Smoking becomes a habit when it is repeatedly associated with specific situations, emotions, or times of the day [42]. For example, a smoker might habitually light up a cigarette after meals, during breaks at work, or in social situations. For smokers who have integrated smoking into their daily lives, losing the company of cigarettes can be extremely painful. Cravings are unavoidable, and it is difficult to refuse a cigarette in a habitual situation.

> *When I started to quit smoking, I suddenly realized that something was missing in my life. Can you*

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> *imagine how difficult it was ... This made it easy to relapse again.* [Participant 1, male]

Therefore, identifying these "high-risk" situations that trigger smoking behavior is a vital step toward long-term quitting, allowing smokers to consciously avoid these high-risk cues. The recording feature is designed to help smokers become more aware of their craving patterns, therefore identifying high-risk situations and planning coping strategies in advance.

> *The app has the function enables users to record cravings, including the intensity and how the feeling was when cravings come.* [Participant 24, male]

However, smokers' existing attitudes toward cravings affect their expectations of the craving recording feature. Smokers who recognize that it is normal to have cravings were more likely to expect to benefit from recording them. Many smokers define successful smoking cessation as complete abstinence from smoking, viewing any relapse as a total failure [43]. This "all-or-nothing" mindset can intensify the fear of cravings, potentially leading to disengagement with this feature.

> *I did not use the app to track my smoking cravings because I wanted to quit smoking completely, so I did not want to engage with information related to cravings.* [Participant 19, male]

Usability

Ease of Use

Ease of use reflects important aspects of usability, especially learnability and user satisfaction [44]. Ease of use is a prerequisite for the success of smoking cessation apps because it affects user engagement level. It influences how easy users feel they can find the features that meet their needs to achieve goals and how much efforts are needed to interact with these features. Smoking cessation apps that are easy to use can quickly attract new users and encourage them to engage with the app.

> *The app is easy to use, and I can quickly understand the function of each button. For example, the check-in button. I think this is also why I chose to continue using this smoking cessation app. I had used another app before, which was not very intuitive. I remember using the check-in function, but it turned out that the button was for recording relapses.* [Participant 5, female]

Multiple Modalities

Providing multiple modalities, such as text, audio, and video formats, in smoking cessation apps can enhance their effectiveness and efficiency [45]. Combining different media formats provides more comprehensive support to users [46]. In this study, smokers expressed that they expected apps to use multiple modalities.

> *The more diverse the formats are, the more I can learn and gain. The more, the better.* [Participant 4, male]

The multimedia approach meets different user needs and preferences since each media format has its own advantages that cater to different use situations. For example, video format is highly favored by users seeking a more dynamic and engaging way of learning, as videos combine visual content, audio elements, and even interactive elements.

> *Heavy texts can make user tired of reading them. I think video format is better because we can see the subtitles on the screen and hear the sounds.* [Participant 13, male]

Visual Design

Visual design elements, such as color scheme and aesthetics, play a crucial role in increasing user engagement [47]. A smoking cessation app with a visually appealing design will attract users and make users more willing to use the app.

> *The app's color is quite pleasant. The green color is soothing for me.* [Participant 9, male]

However, users had different preferences regarding color schemes and interface styles, suggesting that visual design preferences varied among app users.

> *The green color of the app's icon and interface did not look very youthful.* [Participant 5, female]

User Experience

User Privacy

Users' willingness to engage with an app is influenced by their trust in the extent to which an app protects their personal information [48]. However, when asked whether they were worried about privacy issues, all participants indicated that they did not worry about privacy issues and believed their privacy was protected. One of the reasons might be a potentially widespread underestimation of the importance of privacy in app use. Users often place implicit trust in major app stores, believing that apps downloaded there are entirely secure.

> *This app was downloaded from Huawei's app store. It does not require any personal information like my name. I feel that if there were privacy concerns, it would more likely occur with unauthorized or unofficial apps that secretly collect data.* [Participant 20, male]

Another reason might be that users use strategies to protect their privacy based on their own understanding of what data can be collected and how data are collected by the app [49]. However, users may not fully understand to what extent apps can collect and use their personal data or underestimate the risk of data misuse by apps.

> *I used the pseudonyms and a virtual profile picture within the app. I didn't use my real name or pictures of myself. I am not worried about any privacy issues.* [Participant 4, male]

Record Keeping

In smoking cessation apps, providing the record-keeping feature is important to improve user experience since users may have several attempts during smoking cessation. It increases long-term user engagement because users are more likely to continue using the app if they know that their data and progress are saved with continuity.

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> *I downloaded this app again, and it kept my records in it. I have an account in it, so the app will record my progress and data all the time.* [Participant 22, male]

Although this feature allows apps to store users' personal data on their servers, which can raise data security concerns, no participant reported worrying about their data security while enjoying the record-keeping feature.

Advertising and Membership Fees

Advertisements and membership fees are 2 factors that influence user experience. Some participants mentioned that they encountered a few seconds of advertisements when entering the app. These advertisements could slow down app loading, increasing user waiting time. However, most smokers showed a high tolerance toward advertisements in this study. This could be related to the brief duration of the advertisements that it was just a few seconds and users can choose to "skip" advertisements easily. An alternative explanation might be that these users have become accustomed to seeing advertisements on various apps since a lot of apps contain advertisements nowadays. For free-to-use apps like a smoking cessation app in the Chinese market, users may even be more tolerant to the presence of advertisements, as they understand that this is the financial source that supports the app maintenance and operation.

> *The app I use now has some advertisements. I see some advertisements when I enter the app, but I can simply skip them. I think being able to use the app for free is quite good. Apps also need financial sources to be maintained, and they might rely on advertising revenue to keep running. I don't see any major issues with that.* [Participant 4, male]

Some participants perceived premium membership features negatively, particularly when they were uncertain about the value of the additional content. One participant even noted that they would not access the premium section even if it was free, suggesting limited interest in paid features overall.

> *There's a premium section, which is only accessible to members. Even if they offer it to me for free, I wouldn't bother to click and check it.* [Participant 16, female]

Gamification

Gamification is the application of game elements in nongame contexts, such as smoking cessation apps, aiming to increase user engagement and boost user experience [50]. In this study, the gamification elements mentioned by participants included the rank and reward systems. For example, *Smoking Cessation Army* uses a military ranking system that allows users to unlock higher ranks after checking in for a specified number of days. Progressing through these ranks represents users' achievements in smoking cessation. This gamification feature may make the app more enjoyable to use, thereby increasing user satisfaction and encouraging continued engagement with the app.

> *It can be used to check-in smoke-free days. Viewing these numbers puts you in a better mood ... From the soldier to the commander, there's still a sense of achievement.* [Participant 9, male]

In *Smoking Cessation Army*, another gamified element of the app is providing rewards to users who achieve specific days of continuous smoking cessation, such as 21 or 100 days. The rewards, such as a real necklace engraved with the number of smoke-free days, as a return for their efforts in quitting smoking and as proof of achievement, greatly encourage smoking cessation efforts, helping them to persist in quitting. Even if these rewards require them to pay in the app's store, users are willing to pay for them because they perceive these rewards as valuable.

> *You can apply for a physical medal, but you need to pay for it. However, if you successfully quit, receiving that medal can be a significant psychological reward at the time.* [Participant 1, male]

Personalization

Personalization means apps provide tailored support based on user needs and preferences. Providing generic and standardized support may not meet the specific needs of some users. Personalized support that considers users' preferences and needs can provide customized services or content based on users' unique needs and preferences.

When asked about personalized features in smoking cessation apps, participants reported that the lack of personalization negatively affected their user experience. Interview findings also suggested that smokers were less likely to engage with features they perceived as too generic and preferred information tailored to their individual needs. For example, one participant reported that the information provided by the app's withdrawal symptom education feature was too generic to meet his needs. As a result, he preferred to search for information online rather than use the app.

> *The app feature that provides methods to manage cravings didn't have a significant impact; for example, some of the content focuses on quitting smoking methods and symptoms ... you can find similar information elsewhere ... so why do I have to use this app? Searching for information online is more convenient.* [Participant 1, male]

Discussion

Principal Findings

The findings of this study suggest that smoking cessation apps may be particularly beneficial for smokers who are motivated to quit and perceive app-based support as useful. This finding was consistent with the transtheoretical model, which suggests that individuals in the preparation stage can benefit more from behavior change interventions [51]. This study also found that self-efficacy plays a vital role in long-term abstinence [52]. When smokers are more confident in their ability to quit smoking successfully, they are more likely to persist in smoking cessation in the long term. Smoking cessation apps provide extrinsic motivation, such as tracking quitting progress, which acts as a key factor in enhancing self-efficacy. When their quitting achievements and capabilities are confirmed by various data displayed in the app, their self-efficacy may increase. However, the findings also suggest that as smokers become

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more confident in their ability to quit, their reliance on the app may decrease, resulting in lower engagement with features such as daily check-ins. This is consistent with previous research describing "productive disengagement," whereby reduced engagement with a smoking cessation app did not necessarily indicate failure but could occur alongside successful progress in quitting [53]. This finding has broader implications for how engagement with mHealth interventions is conceptualized and evaluated. A recent systematic review found substantial variation in how engagement is defined and measured across 292 studies, with objective use metrics, particularly app or website log-in data, being the most commonly used measures of engagement [54]. However, reliance on such metrics may favor the quantity of engagement at the expense of its quality, as less frequent interaction with a particularly useful feature may still represent meaningful engagement [53,54]. In this study, reduced engagement of features such as daily check-ins may not necessarily indicate reduced intervention benefit, particularly when users' need for digital support changes as their self-efficacy increases. Therefore, evaluations of mHealth interventions may benefit from moving beyond the quantity of use to consider whether engagement is meaningful and how patterns of engagement relate to users' changing support needs and behavioral progress [54,55].

Consistent with the protection motivation theory, smoking cessation apps may motivate behavior change through both threat- and coping-related pathways [56,57]. However, this study found that positive stimuli were more attractive to smokers, such as the benefits of quitting smoking, compared to negative stimuli, such as the risks of smoking. This finding is consistent with previous research findings [58-62]. For instance, Edwards et al [59] found that smokers preferred apps to focus more on positive emotional content to promote relaxation and happiness during smoking cessation. Although app developers design smoking cessation apps that leverage the strengths of both pathways to motivate smokers to quit, the use of negative stimuli should be carefully considered due to potential unintended outcomes that trigger cravings.

This study found that experiencing social isolation, including social stigma and a sense of loneliness, may increase the perceived value of social support features. Smokers seek emotional support and informational support from other quitting peers in smoking cessation apps [63,64]. A recent systematic review found that social support strategies in digital interventions have largely relied on social facilitation, particularly forums and discussion boards, while strategies such as competition and cooperation remain relatively underexplored [65]. Evidence from mHealth interventions promoting physical activity has also shown that competition and social comparison can be motivating for some users, although preferences for these forms of interaction vary between individuals [66]. In our study, however, competition was not deliberately built into the app as a separate feature, but a sense of healthy competition arose naturally when smokers interacted with peers working toward the same goal, which can motivate smokers to stay abstinent. This suggests that social features in mHealth interventions may operate through mechanisms beyond the provision of emotional and informational support, as interaction between users can also generate social comparison and positive competition. When designing such features, consideration should be given not only to their intended functions but also to social dynamics, such as comparison and competition, that may emerge through peer interaction.

Although smoking cessation apps use strategies to prevent relapse [67], this study found that engagement with the withdrawal symptoms education feature was low. This finding echoed previous research that explored the effectiveness of relapse prevention interventions in smoking cessation. Livingstone-Banks et al [68] found no evidence of long-term benefit from skills-based behavioral interventions designed to help abstinent smokers identify high-risk situations and develop strategies to cope with urges to smoke. Among smokers who had successfully quit following a formal cessation program, pooled evidence from 10 studies (n=5408) showed no long-term benefit of these interventions (RR 0.99, 95% CI 0.87-1.13). In addition, the review found no difference between higher-intensity interventions, characterized by repeated face-to-face contact aimed at coping and cognitive strategies, and lower-intensity interventions, which primarily delivered these strategies through written materials, sometimes supplemented by brief face-to-face or telephone contact. This suggests that intervention intensity alone may not explain the limited effectiveness of skills-based relapse prevention. The current study identified 2 possible reasons for the low engagement of these features. The first possible reason was the mismatch between user needs and features. The second reason was the low-intensity and nonpersonalized support provided by apps. The present findings suggest that the design of relapse prevention support may be important, particularly whether support is personalized, actionable, and accompanied by resources that facilitate its implementation. In this study, the withdrawal symptom recording feature worked for smokers who held an open and realistic attitude toward cravings and believed that they could benefit from recording their cravings. Previous studies also emphasized the importance of accepting cravings as a normal part of smoking cessation. For example, mindfulness-based smoking cessation interventions aim to increase smokers' awareness of their cravings by observing thoughts, emotions, and sensations when cravings arise [69,70].

Good usability and user experience design can predict higher user engagement levels, helping smokers interact with apps more effectively, efficiently, and with satisfaction [71]. The findings of this study indicated that usability could be improved through ease of use, providing different media formats and visually appealing interfaces that consider diverse user preferences and accessibility needs. Although participants did not explicitly request interface customization, their differing preferences regarding interface color schemes suggest that offering customizable visual design options could be one approach to accommodating diverse user preferences. Notably, participants' preference for multiple modalities did not necessarily imply a preference for greater complexity, as they also emphasized that apps should remain simple, intuitive, and easy to use. This suggests that smoking cessation apps could offer users a choice of content formats while maintaining a simple and intuitive user experience. The predominantly highly

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educated sample in this study should also be considered when interpreting these findings. All but 2 participants (22/24) had a tertiary degree, and educational background may influence how users engage with and interpret digital health information [72]. Therefore, it is important to consider users with diverse educational backgrounds when designing and evaluating smoking cessation apps, as digital literacy and health literacy may influence users' ability to access, interpret, and act on digitally delivered health information.

Lack of personalization may negatively influence user experience in this study. Personalization has increasingly been identified as an important consideration in the design of digital behavior change interventions [73]. However, in this study, few participants explicitly requested greater personalization, despite describing generic and nonpersonalized support as a limitation. This discrepancy may be because smokers had a low perceived usefulness of smoking cessation apps and consequently limited expectations of the support these apps could provide. Alternatively, this discrepancy may provide further insight into how personalization may be understood from a user perspective. Users may recognize that support does not adequately respond to their circumstances or needs without necessarily conceptualizing "personalization" as the solution. Co-design may help bridge this gap by moving beyond asking users which specific features they would like and instead exploring their experiences, unmet needs, and challenges when using smoking cessation apps [74,75]. These needs can then be collaboratively translated into design solutions, including decisions about when and how support should be tailored to individual users.

Limitations

This study has several limitations. First, the sample was relatively young and highly educated, with all but 2 participants having a tertiary degree, which may be related to the recruitment strategy using social media advertisements. This may limit the representativeness of the findings, particularly their applicability to smokers with primary or secondary school education. Additionally, the majority of participants were male; this sex imbalance should also be considered when interpreting the findings of this study. Despite this, participants included individuals from different professional roles and geographical locations, which provided a range of perspectives. Second, data collection with smokers was conducted online, which may have reduced the availability of nonverbal cues and potentially affected rapport and data richness. Third, detailed smoking characteristics, such as cigarettes smoked per day and duration of smoking, were not systematically collected. This limited the ability to explore whether participants with different levels of smoking intensity or tobacco dependence experienced smoking cessation apps differently. In addition, data about participants' use of other smoking cessation aids, including pharmacological interventions and e-cigarettes, were not systematically collected, and past or concurrent use of other smoking cessation aids may have influenced participants' experiences and perceptions of smoking cessation apps. Future research could consider the concurrent use of different smoking cessation approaches when examining the role of smoking cessation apps. Finally, although this study identified links between usability, user experience, and engagement, no dedicated user study was conducted to further examine these relationships, which is beyond the remit of this study.

Conclusions

This study explored Chinese smokers' experiences of using smoking cessation apps. The findings highlight the importance of motivation and self-efficacy in sustaining smoking cessation, the value of social support in providing both support and motivation, the need for more actionable and responsive relapse prevention support, and the role of usability and user experience design in facilitating engagement. These findings have broader implications for the design and evaluation of mHealth behavior change interventions.

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Data Availability

The qualitative interview data generated and analyzed during this study are not publicly available due to the potential risk of participant identification and restrictions associated with ethics approval and informed consent, but selected anonymized data may be available from the corresponding author on reasonable request.

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Generative AI Use

The authors declare that generative AI was used in the creation of this manuscript. Generative AI (ChatGPT) was used for proofreading, editing, or language polishing. The authors verified all outputs of the tool(s) used in the preparation of this manuscript and take full responsibility for the final content of the manuscript.

Authors' Contributions

Conceptualization: MZ, LD, MW
Data curation: MZ

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Formal analysis: MZ
Investigation: MZ
Methodology: MZ, LD, MW, CC
Supervision: LD, MW, CC
Validation: LD, MW, CC
Writing – original draft: MZ
Writing – review & editing: LD, MW, CC

Conflicts of Interest

None declared.

Multimedia Appendix 1

Participant interview guide.
[DOCX File , 46 KB-Multimedia Appendix 1]

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Abbreviations

mHealth: mobile health
RR: risk ratio
SRQR: Standards for Reporting Qualitative Research

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