



“I’m using cigarettes to quit JUUL”: An analysis of Twitter posts about JUUL cessation



Jennifer B. Unger*, Christopher Rogers, Jessica Barrington-Trimis, Anuja Majmundar, Steve Sussman, Jon-Patrick Allem, Daniel W. Soto, Tess Boley Cruz

University of Southern California, Tobacco Center of Regulatory Science, United States

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ABSTRACT

Introduction: JUUL, a small pod-based vaping device that aerosolizes nicotine salts, is popular among adolescents and young adults. Because of JUUL’s high nicotine content, JUUL users can become nicotine dependent very quickly and have difficulty quitting. Nicotine-dependent JUUL users might turn to Twitter to seek advice, share their cessation struggles, or report their success rather than confiding in friends or family.

Method: This study analyzed Twitter tweets (N = 3192) posted in 2018–2019 to identify common themes about quitting JUUL. Tweets containing the keywords “JUUL” and “quit” or “quitting” were analyzed qualitatively and grouped into themes.

Results: The most common themes were Methods to quit (25.4%), Have quit (17.8%), Want to quit (16.1%), Reasons to quit (9.6%), Difficulty quitting (7.9%), Barriers to quitting (2.9%), and Curious about quitting (2.1%). Methods to quit included evidence-based tobacco cessation methods such as nicotine replacement therapy and enrolling in a text-to-quit program, but they also included non-evidence-based strategies such as buying lower-nicotine pods online or switching to other tobacco products including cigarettes. Former JUUL users who had quit successfully generally expressed pride but also acknowledged that quitting was very difficult. Reasons for quitting included adverse health effects such as breathing problems and the financial cost of a JUUL habit. Posters mentioned their extreme difficulty quitting JUUL, numerous failed quit attempts, and numerous barriers to quitting including intense physical and emotional withdrawal symptoms. Some posters joked about switching to cigarettes or other drugs to quit JUUL.

Conclusion: Results indicate that JUUL cessation is difficult and that some JUUL users want to quit. Health communication messages are needed to direct JUUL users to effective cessation strategies.

1. Introduction

JUUL, a small pod-based nicotine delivery device that vaporizes nicotine salts, has become increasingly popular among adolescents and young adults since its introduction in 2015 (Vallone, Bennett, Xiao, Pitzer, & Hair, 2019), becoming the most commonly used vaping product among youth in 2019 (Cullen, Gentzke, & Sawdey, 2019). The amount of nicotine delivered by one pod is high compared to many other brands of e-cigarettes, equivalent to a pack of combustible cigarettes (Labs, 2019), though analyses of JUUL pods and JUUL-compatible replacement pods have reported even higher concentrations of nicotine than published on the packaging (Goniewicz, Boykan, & Messina, 2019; Voos, Goniewicz, & Eissenberg, 2019). In 2019, past-month prevalence of JUUL in the U.S. was 7% among 8th graders, 15% among 10th graders, and 16% among 12th graders (Leventhal et al.,

2019). In 2019, 59% of high school e-cigarette users reported that JUUL was their preferred brand (Russell, Katsampouris, & McKegane, 2020). In 2018, 39% of U.S. adolescents had heard of JUUL (McKegane & Russell, 2019). Over half of adolescents and young adults who had ever tried JUUL reported that they used JUUL in the past month, suggesting that the addiction potential of this product is high (Krishnan-Sarin, Jackson, Morean, Kong, Bold, & Wu, 2019). Although JUUL might be a less harmful alternative to combustible cigarettes for smokers who are unable or unwilling to quit smoking (Huang et al., 2019), the high nicotine content of JUUL devices could escalate nicotine dependence among users, potentially making nicotine cessation more difficult (Boykan, Goniewicz, & Messina, 2019; Goniewicz et al., 2019; Hammond, Wackowski, Reid, & O’Connor, 2020; Vogel, Prochaska, Ramo, & Andres, 2019). Compared with adolescents who used other brands of e-cigarettes, JUUL users were more likely to report that they

* Corresponding author.

E-mail address: unger@usc.edu (J.B. Unger).

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had tried and failed to quit (Hammond et al., 2020). Moreover, the rapid development of nicotine dependence might take novice JUUL users by surprise because a substantial proportion of adolescents believe that JUUL is less addictive than combustible cigarettes (Russell et al., 2020) and are unaware of JUUL's nicotine level (McKeganey, Russell, & Haseen, 2020; Morean, Bold, Kong, Gueorguieva, Camenga, Simon, & Krishnan-Sarin, 2019). Therefore, it is likely that numerous JUUL users have inadvertently become nicotine dependent and are now having difficulty quitting JUUL.

Recent news stories have documented that JUUL users, including adolescents, are having difficulty quitting JUUL (Creswell & Kaplan, 2019; Paul, 2019). One news story reported that some JUUL users were so addicted to JUUL that they were actually switching to combustible cigarettes in an attempt to reduce their nicotine intake (Ibarra, 2019). Research is needed to understand the subjective experience of JUUL users who have become nicotine-dependent and are attempting to quit. Nicotine-dependent JUUL users might not be comfortable talking about quitting with their parents, peers, or medical providers. They might turn to Twitter to seek advice, share in their struggles, or report on their success.

Twitter is a social media platform used by 22% of U.S. adults (Pew Research Center, 2019) and 32% of adolescents (Pew Research Center, 2018). Analysis of publicly available Tweets can provide insights into discussions about a topic, similar to a large focus group (Allem, Dharmapuri, Unger, & Cruz, 2018). This study examined tweets about quitting JUUL to gain a more comprehensive understanding of how JUUL users experience and discuss their attempts to quit JUUL. We hypothesized that common themes would emerge, including interest in quitting, difficulty in quitting, barriers to quitting, and successful and unsuccessful quit attempts.

2. Methods

Twitter posts containing the terms “Juul” or “Juuling” were obtained from Twitter’s Streaming Application Program Interface (API; the filtered stream using the Twitter4J library for collecting tweets with no gaps in the collection time) from January 1, 2018 to July 15, 2019. The data were cleaned by removing retweets, tweets from high-frequency users, tweets from the JUUL company and JUUL retailers, and non-English tweets. This resulted in a sample of 1,575,465 tweets. These tweets were then searched for the terms “quit” or “quitting”. Tweets that contained both a JUUL keyword and a quit keyword (N = 3875) were retained for analysis. Next, we removed tweets from accounts identified as social bots (Allem & Ferrara, 2018, 2016) using Botometer (Davis, Varol, Ferrara, Flammini, & Menczer, 2016), resulting in a final analytic sample of 3192 tweets. All analyses relied on public, anonymized data; adhered to the terms and conditions, terms of use, and privacy policies of Twitter; and were performed with Institutional Review Board approval from the authors’ university. To protect privacy, no tweets are reported verbatim in this report.

Based on an initial examination of emergent themes by three independent coders, the 3192 tweets were coded into 8 categories: Reasons to quit (included health, social, and financial reasons), Barriers to quitting (mental, physical, social, or physiological conditions that hindered cessation), Methods to quit (included evidence-based nicotine cessation methods such as nicotine replacement therapy, counseling, and setting a quit date, as well as non-evidence-based methods such as laser treatments or switching to a different flavor or brand), Have already quit (statements from people who had quit successfully), Difficult to quit (emotional expressions of how challenging it is to quit), Curious about quitting (questions about quitting from people who were contemplating a quit attempt), and Other (jokes, memes, etc.). Two trained coders coded the tweets independently. We refined the definitions of the codes, retrained the coders, and recoded the tweets until inter-coder reliability reached 94.5%. Discrepancies were resolved by discussion among the two coders and the authors. To avoid double-counting

Table 1
Frequencies of themes (N = 3192 tweets).

Theme	N	Percent
Methods to quit	812	25.4%
Have quit	568	17.8%
Want to quit	515	16.1%
Reasons to quit	305	9.6%
Difficult to quit	253	7.9%
Barriers to quitting	93	2.9%
Curious about quitting	66	2.1%
Other	580	18.2%

tweets and artificially inflating the categories, we required the coders to classify each tweet into only one category. When two categories appeared to be relevant, the coders discussed the tweet and came to consensus about which theme best captured the main message of the tweet. Frequencies of the codes were computed. Examples of tweets presented in this article were paraphrased to maintain the anonymity of the posters and to clarify slang terms and abbreviations.

3. Results

Table 1 shows the frequency of themes. The most common theme was Methods to quit, followed by Have quit and Reasons to quit. Examples of each theme are described in detail below.

3.1. Methods to quit

The most common theme was methods to quit JUUL, which represented 25.4% of the tweets. Examples of methods to quit JUUL included strategies that are often recommended for quitting cigarettes, such as making a New Year’s resolution, setting a quit date, distracting oneself with alternative activities, using nicotine replacement therapy or pharmacotherapy, switching to a less preferred flavor, throwing away the device, and gradually decreasing the dose.

I got Nicoderm patches to quit Juuling and I think it’s working.

I quit Juuling with Chantix.

Want to quit Juuling? Buy the Virginia Tobacco flavored pods.

Today me and [friend] quit Juuling. We threw ours out the car window together.

There were advertisements for text-to-quit programs from reputable sources such as the Truth Initiative “This is Quitting” program (Initiative, 2020), but there were also advertisements for non-evidence-based methods such as services that would mail JUUL users JUUL-compatible pods with progressively lower nicotine content, laser treatments, and other non-evidence-based methods.

Ready to leave JUUL behind? Text “DITCHJUUL” to [number] #ThisIsQuitting — a text-to-quit vaping program helping 70,000 people and counting.

The best way to quit JUUL is to wean down. We have custom pods in mint and mango that start you off at 5 nicotine and wean down to 0. Need help quitting JUUL or other vapes? We can help you in one laser session.

In addition to mainstream and alternative methods to quit, tweets about methods of quitting JUUL also included jokes or sarcasm. Many of these tweets described switching to a more dangerous substance to quit JUUL:

I’m using cigarettes to quit JUUL.

Might have to start smoking again to quit JUUL.

If you’re looking for an affordable method to quit Juuling, there’s a new product called a cigarette containing 95 less nicotine than one JUUL pod.

Quit JUUL, take Geebs [a type of bong used to smoke marijuana].

Quit JUUL. Time to grow up and do crack.

Posters also noted events that coincidentally helped them to quit, although they were not necessarily planning a quit attempt. These included losing or destroying the JUUL or running out of money:

Tip to quit Juuling—drop it out of a speeding car.

Nothing gives you incentive to quit Juuling like falling in the lake and drowning your JUUL.

Quit Juuling because it fell in the toilet.

Easiest way to quit Juuling: be broke

3.2. Have quit

The second most common theme (17.8%) was that the poster had already quit JUUL in the recent or distant past. Most expressed pride that they quit successfully, but most also mentioned some difficulty.

I Can proudly say that I quit Juuling. I deserve a gold [medal].

It is almost 3 months since I quit Juuling. I had the worst addiction ever.

Quitting JUUL was the best decision of my life.

I Quit Juuling. It has been hard but not impossible.

I'm proud of myself. Today me and [friend] quit Juuling.

3.3. Want to quit

The theme of wanting to quit represented 16.1% of the tweets. Most indicated some anxiety or doubt about their ability to quit.

My goal is quitting juul. Right now it does not look good.

Want to quit JUUL but I don't know if I can.

Some posts appeared to be public commitments or announcements, with the intention of enlisting emotional support or accountability.

I, [name], will quit Juuling my second semester of my senior year.

Hear ye, hear ye, I have an announcement. I am quitting Juuling

Speak it into existence: I will quit Juuling.

Everyone pray for me as I quit Juuling today.

I'm quitting Juuling, y'all! It's gonna happen. Here's to healthy lungs.

I'm going to quit Juuling when I'm done with this pod. Retweet if you think I can't. Like if you know I can.

3.4. Reasons to quit

Reasons to quit represented 9.6% of the tweets. Most reasons involved adverse health effects that the user was experiencing, including breathing problems and sore throats:

I quit Juuling because I get out of breath too easily.

I need to quit Juuling. It's messing up my throat.

My lungs are so damaged from Juuling. I quit Juuling almost a month ago and I wake up every night and morning and can't breathe.

All high school students need to quit Juuling. I'm out of breath from walking from one class to another.

I Found out I'm having breathing and lung problems so to help myself I'm going to quit JUUL.

Other reasons for quitting JUUL included the monetary expense. Posters calculated the amount of money they were spending on JUUL, buying pods and replacing lost or broken JUULs.

Trying to quit Juuling because I can't afford it anymore.

This quitting Juuling kinda sucks. I'd rather be Juuling than quitting but I'd rather quit than spend 60 bucks on a starter pack.

I'll tell you why I want to quit Juuling and nicotine altogether. I go

through 2 packs of pods a week. That's \$34 a week. That's about \$1700 a year not including buying another JUUL after losing one. Easiest way to quit Juuling: 1 lose your JUUL. 2 buy a new JUUL. 3 repeat steps 1 and 2 at least 30 times. 4 realize you've spent more money on your nicotine addiction than just about anything else but rent, car, and food.

Posters also mentioned that the social image of a JUUL user was immature, and they did not want to conform to that image:

Am I ever going to quit Juuling or am I going to be 32 Juuling at my son's soccer game?

I'll quit JUUL at 23. Vaping older than that is just weird.

3.5. Difficult to quit

A small but notable proportion of tweets (7.9%) expressed that quitting JUUL is difficult. Some users sarcastically expressed that they quit numerous times, implying that they also had relapsed numerous times.

Quitting JUUL is easy - I've done it about 30 times.

Currently trying to quit Juuling for the 235,711 time. Wish me luck, I guess.

If you've said that you're going to quit JUUL and then relapsed multiple times over, I feel you.

Others had just begun a quit attempt and expressed the difficulty of quitting.

I Tried to quit JUUL and after 5 h realized that it's impossible.

Operation quit Juuling is 7 min in and I am already weak.

Trying to quit JUUL is the hardest thing I've ever done.

I'm trying to quit Juuling and I'm more addicted to this USB than I was to cigs. This is about to be a full-on battle.

I Quit Juuling this week and every night I'm having dreams about JUUL.

Why is quitting JUUL so hard? I'm always thinking about Juuling if I'm not occupied.

Quitting cigs was so much easier than quitting Juuling.

3.6. Barriers to quit

A small number of tweets (2.9%) mentioned specific barriers to quitting JUUL. Barriers included physiological and psychological symptoms of nicotine withdrawal (e.g., headaches, anxiety, lack of concentration, depression, insomnia) as well as fear of gaining weight,

Day 1 of quitting JUUL and my body is crying for nicotine.

Quit Juuling 8 h ago. My head hurts.

It hasn't even been a full 3 days since quitting Juuling and my anxiety is so bad I am literally freaking out.

Day one trying to quit Juuling. I want to fight someone.

When I quit cigs I was sick, but with JUUL I'm just exhausted and so emotional and anxious and mad about everything.

Day 4 of quitting Juuling. Symptoms: intense migraines, severe anxiety, sleep jerks, tightness in chest, lack of concentration, insomnia, depression.

I Quit Juuling and already feel fat.

Some posters also mentioned emotional and situational barriers to quitting, such as stressful situations that caused them to delay a quit attempt.

I was gonna quit JUUL today but I'm in a bad mood so never mind. I would have quit Juuling a long time ago but people stress me out. Said I quit Juuling but then I took that chemistry exam.

Social barriers included being around friends who were Juuling or

being given a JUUL or JUUL pods:

Was going to quit Juuling but then someone gave me their JUUL so I will quit later.
That feeling when you quit Juuling and someone walks into the room with one.

3.7. Curious about quitting

A small number of posts (2.1%) of the posts expressed curiosity about how to quit JUUL. Most simply asked how to quit:

How do you quit JUUL?
It's time. How can I quit JUUL?
Find me someone who has quit Juuling and let me know how to do it.
Got any tips for quitting JUUL besides drinking more water?
Is there a quitting JUUL support group?
About to quit Juuling. Anyone have any experiences with it? How long did your cravings last, etc.?

Some posters also mentioned that they had used JUUL to quit cigarettes, but now they were having trouble quitting JUUL:

Stopped smoking cigarettes, how do I quit Juuling now?
I'm no longer addicted to cigs so I'm ready for something to help me quit my JUUL and then something that helps me quit the thing that helps me quit JUUL.

4. Discussion

Several common themes emerged in this sample of Twitter tweets about quitting JUUL. The most common theme was methods to quit. Some posters reported quitting JUUL with methods that are evidence-based for quitting nicotine, such as nicotine replacement therapy or pharmacotherapy (García-Gómez, Hernández-Pérez, Noé-Díaz, Riesco-Miranda, & Jiménez-Ruiz, 2019). Others had signed up for cessation programs from reputable sources such as the Truth Initiative text-to-quit program. However, there were also advertisements for cessation strategies that are not evidence-based, including a company that purports to mail the user JUUL-compatible pods with progressively lower nicotine content and laser treatments. Despite JUUL's campaign claim to "Switch to JUUL," users are exploring ways to stop using it rather than maintain it as an alternative to cigarettes. Because JUUL users might turn to Twitter for advice about quitting, public health agencies could post links to information about evidence-based cessation methods to counteract the numerous advertisements for non-evidence-based methods.

Twitter users posted that they had quit JUUL successfully. Most of these users expressed the difficulty of quitting JUUL and expressed pride that they had quit successfully. Perhaps public health communications for youth could feature young people who quit JUUL successfully, similar to the CDC Tips From Former Smokers, a health communication campaign aimed at middle-aged former cigarette smokers (Neff et al., 2016). Media exposure to adolescent and young adult role models who successfully quit JUUL could increase cessation self-efficacy among JUUL users and create a social norm that quitting JUUL is desirable.

It is encouraging that some Twitter users posted that they want to quit and were ready to quit JUUL. Some of these tweets appeared to be public commitments to quit, intended to increase accountability and enlist support from their social networks. Previous substance use prevention and cessation programs have encouraged participants to make a public commitment not to use substances to increase their motivation, accountability, and internal locus of control (Hernández-Serrano, Griffin, García-Fernández, Orgilés, & Espada, 2013; Hughes, Russ, Arteaga, & Rennard, 2011; Skara & Sussman, 2003). Future studies

could determine whether making a public commitment on social media increases JUUL cessation success. JUUL cessation interventions for people who are active on social media could encourage them to post their commitment on social media and elicit support from online friends.

Participants noted numerous reasons to quit JUUL. Most reasons involved health effects that were interfering with their daily lives, such as getting out of breath during physical exertion or experiencing lung or throat pain. The increased media coverage of vaping-related lung injury (Cherian, Kumar, & Estrada -Y- Martin, 2020) could motivate more JUUL users to attempt cessation. Further research is needed to describe the acute and chronic health effects of vaping JUUL and other products.

Posters reported numerous failed quit attempts and reported that quitting JUUL was more difficult than they had expected. Recent quitters reported numerous physiological and psychological withdrawal symptoms. This is not surprising given JUUL's high nicotine content (Boykan et al., 2019; Goniewicz et al., 2019; Hammond et al., 2020; Vogel et al., 2019). Research is needed to develop clinical practice guidelines for quitting vaping products with very high nicotine levels. It is likely that JUUL users will present with high nicotine dependence and will need a combination of pharmacotherapy and counseling, which is recommended for highly dependent cigarette smokers (García-Gómez et al., 2019).

One promising finding from this study is that some JUUL users want to quit and are attempting to quit. Survey data from representative samples are needed to estimate the proportion of JUUL users who want to quit and are attempting to quit. Surveys also could provide more information about the cessation methods that JUUL users are trying, the barriers they are experiencing, and the best ways to reach them with effective cessation programs.

Posts about JUUL are prominent on social media (Chu et al., 2018). Previous studies have found that most JUUL-related posts on social media focus on its popularity, social use, flavors, purchasing, promotions, and discreet use (Allem et al., 2018; Brett et al., 2019; Czaplicki et al., 2019). However, social media posts have increasingly mentioned the difficulty of quitting JUUL. A 2017 Twitter analysis (Allem et al., 2018) found that fewer than 1% of tweets mentioned quitting. An analysis of JUUL tweets over the 2017–2018 winter holiday period (Kavuluru, Han, & Hahn, 2019) found that 2% mentioned dependence, although these were often lighthearted. An analysis of JUUL posts on Reddit in 2015–2017 (Brett et al., 2019) found that 11% of posts expressed concerns about addictiveness. More recent Twitter analyses also have found that higher proportions of JUUL tweets mention nicotine dependence and quitting. A Twitter analysis conducted in the spring of 2018 (Sidani, Colditz, Barrett, Shensa, Chu, James, & Primack, 2019) found that 21% of JUUL posts expressed concerns about nicotine dependence, withdrawal, or quitting JUUL. It is possible that discussions of quitting JUUL have become more prevalent recently as a result of the increasing media attention to youth who are addicted to JUUL. In addition, even if tweets about quitting JUUL represent only a small proportion of all JUUL tweets, it is still important to understand the experiences of people who are trying to quit JUUL, so that people who want to quit JUUL can be directed to effective nicotine cessation methods. However, previous studies have only mentioned quitting as one of many topics discussed in posts about JUUL; they have not focused specifically on what people are saying about their quit attempts, the difficulty of quitting, barriers to quitting, or methods used to quit. A more comprehensive understanding of the experience of quitting JUUL could inform efforts to direct JUUL users to effective nicotine cessation resources.

4.1. Limitations

People who post about quitting JUUL on social media might not be representative of the larger population of JUUL users who wish to quit. Because our data were limited to posts that contained keywords about

JUUL and keywords about quitting, our findings cannot estimate the proportion of all JUUL users who are interested in quitting. Sentiments about quitting JUUL also might differ across social media platforms. Data collection for this study ended in mid-2019, before JUUL discontinued its fruity flavors. It is possible that patterns of use of JUUL and other vaping devices have changed since JUUL began selling only tobacco and menthol flavored pods. Even if JUUL declines in popularity after taking its flavors off the market, there are many other vaping products with nicotine salts that deliver high doses of nicotine (Jackler & Ramamurthi, 2019). Especially concerning are the low-cost disposable products, which deliver nicotine doses comparable to those of JUUL but are affordable to youth (Williams, 2019). Posters referred to JUUL as a noun and to Juuling as a verb. It is unclear whether these references pertained to the actual JUUL brand or to vape products and vaping in general. It is possible that JUUL has become a generic term that includes other brands. A Twitter analysis provides snapshots of people's sentiments at a single point in time. With such data, it is impossible to draw conclusions about the posters' patterns of JUUL use, including frequency and duration of use, motivation to quit, and previous quit attempts.

4.2. Conclusion

This analysis of Twitter posts about quitting JUUL indicates that some JUUL users have unexpectedly found themselves addicted to JUUL's high nicotine level and are having difficulty quitting. Health education interventions are needed to warn people that JUUL is addictive and difficult to quit and to steer JUUL users to evidence-based nicotine cessation methods. Cessation research is needed to develop guidelines for cessation of JUUL and other high-nicotine vaping devices.

CRedit authorship contribution statement

Jennifer B. Unger: Conceptualization, Methodology, Writing - original draft, Writing - review & editing, Funding acquisition. **Christopher Rogers:** Conceptualization, Formal analysis, Supervision, Writing - review & editing. **Jessica Barrington-Trimis:** Conceptualization, Methodology, Writing - review & editing. **Anuja Majmundar:** Formal analysis, Data curation, Writing - review & editing. **Steve Sussman:** Conceptualization, Writing - review & editing. **Jon-Patrick Allem:** Conceptualization, Methodology, Software, Data curation, Writing - review & editing. **Daniel W. Soto:** Conceptualization, Supervision, Project administration, Writing - review & editing. **Tess Boley Cruz:** Conceptualization, Methodology, Writing - review & editing, Supervision, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary material

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