Research Article

A Comparative Study of Physical Health and Attentional Processing Among Vape Users and Non-Users in Indian Young Adults

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Abstract

This paper provides an analysis of the disparities in physical health and attentional processing among Indian young adults who are users and nonusers of vapes. A cross-sectional comparative design was employed where 147 participants with a target age of 18-30 years (n= 70 vape users and n= 77 non-users) were used to collect data. The GHQ-12 was used to quantify physical health functioning, and Mindful Attention Awareness Scale (MAAS) was used to quantify attentional processing. Findings showed that there is a big difference in groups, as the vape users reported having more psychological distress and less attentional awareness than non-users. Normativity tests showed that both GHQ and MAAS did not have normal distributions; both the parametric and non-parametric tests were employed to confirm results. On the whole, the paper identifies quantifiable cognitive and health-specific drawbacks related to vaping among young adults, and it is necessary to draw attention to awareness and prevention interventions.

KEYWORDS: Vaping Behaviour, Physical Health Functioning, Attentional Processing, Young Adults, Psychological Distress Mindful Attention Awareness (MAAS), General Health Questionnaire (GHQ-12), Comparative Study

1. INTRODUCTION

1.1 Concept of Vaping

Vaping refers to the inhalation and exhalation of an aerosol, commonly called vapor, produced by electronic cigarettes or vaping devices. Unlike traditional cigarettes, which burn tobacco to produce smoke, vaping devices heat a liquid solution known as e-liquid or vape juice to generate an aerosol that is inhaled into the lungs (World Health Organization [WHO], 2020). Vaping was initially promoted as a less harmful alternative to conventional smoking, but increasing research indicates that it may still pose significant health risks, particularly for adolescents and young adults (U.S. Surgeon General, 2016).

E-liquids typically contain nicotine, propylene glycol, vegetable glycerin, flavouring chemicals, and other additives (Centers for Disease Control and Prevention [CDC], 2022). Nicotine is a highly addictive substance that affects the brain and nervous system and contributes to dependency and repeated use (Benowitz, 2010). Some vaping products may also contain tetrahydrocannabinol (THC), cannabidiol (CBD), or other psychoactive compounds, which may further increase potential health risks (CDC, 2019). Many users, particularly young adults, may not be fully aware of the chemical composition of the substances they inhale.

Vaping devices are available in several forms, including vape pens, pod-based systems, disposable e-cigarettes, and advanced personal vaporizers. Disposable devices are often attractive to beginners because they are inexpensive, portable, and easy to use. Pod-based systems are also popular among young adults due to their convenience and the availability of flavoured liquids (Truth Initiative, 2021). Some advanced devices allow users to adjust temperature and voltage levels, potentially increasing nicotine delivery and exposure to harmful substances (National Academies of Sciences, Engineering, and Medicine, 2018).

Although vaping does not involve combustion like traditional smoking, the aerosol produced still contains potentially harmful chemicals, heavy metals, and ultrafine particles that can penetrate deep into the lungs (WHO, 2019). Therefore, vaping cannot be considered harmless even if exposure to some toxic substances may be lower compared to conventional smoking (CDC, 2022). Understanding the concept of vaping is essential for identifying users and examining its effects on health in research studies.

1.2 Prevalence of Vaping Among Young Adults

Vaping has become a growing public health concern due to its increasing popularity among young adults worldwide. Individuals between the ages of 18 and 30 represent one of the fastest-growing groups of vaping users (WHO, 2020). The rise in vaping among youth is associated with factors such as the availability of flavoured products, peer influence, targeted marketing strategies, and the belief that vaping is safer than traditional cigarette smoking (U.S. Surgeon General, 2016).

In many countries, vaping has become more common among young people than conventional tobacco use. Young adults often experiment with vaping out of curiosity, peer pressure, stress management, or the perception that it is a modern and socially acceptable behaviour (Truth Initiative, 2021). Social media platforms also contribute to the normalization of vaping by portraying it as fashionable and part of contemporary youth culture (WHO, 2020).

In India, vaping presents a unique situation. Although the Government of India banned electronic cigarettes through the Prohibition of Electronic Cigarettes Act in 2019, vaping devices are still accessible through informal markets, online platforms, and peer networks (Ministry of Health and Family Welfare, 2019). As a result, experimentation with vaping continues among college students and urban young adults (Garg et al., 2020).

Sociocultural factors further influence vaping behaviour. Peer influence, curiosity, academic stress, and the attraction of flavoured products often encourage experimentation. Limited awareness of the long-term physical and cognitive risks may also contribute to its continued use among young adults.

1.3 Physical Health Effects of Vaping

Although vaping is often marketed as less harmful than smoking, research indicates that it can negatively affect several aspects of physical health. The aerosol produced by vaping devices contains nicotine, volatile organic compounds, heavy metals, and ultrafine particles that may affect multiple biological systems (WHO, 2020; CDC, 2022).

One of the most significant concerns relates to the respiratory system. Inhalation of heated chemicals and particles can irritate lung tissues and airways, leading to coughing, throat irritation, wheezing, and shortness of breath (CDC, 2022). Long-term vaping has been associated with airway inflammation and reduced lung capacity (National Academies of Sciences, Engineering, and Medicine, 2018). In severe cases, vaping has been linked to serious lung injuries.

Nicotine exposure through vaping may also affect cardiovascular functioning. Nicotine stimulates the sympathetic nervous system, increasing heart rate and blood pressure and placing additional strain on the heart (Benowitz & Fraiman, 2017). Over time, repeated exposure may increase the risk of cardiovascular problems.

In addition to respiratory and cardiovascular effects, vaping may influence general physical wellbeing. Some users report fatigue, headaches, dizziness, and reduced physical endurance (WHO, 2020). Nicotine exposure may also disrupt normal sleep patterns, leading to insomnia or poor sleep quality, which can weaken immune functioning and reduce overall energy levels (CDC, 2022).

1.4 Attentional Processing and Cognitive Functioning

Neuropsychological functioning refers to the relationship between brain activity and cognitive, emotional, and behavioural abilities. It includes processes such as attention, memory, learning, decision-making, and impulse control (Lezak et al., 2012). These abilities are essential for academic

achievement, professional performance, and everyday problem solving.

Memory is an important cognitive function that supports learning and information retention. It includes short-term memory, working memory, and long-term memory (Baddeley, 2012). Executive functions such as planning, decision-making, problem solving, and inhibition allow individuals to regulate their behaviour and achieve goals (Miyake et al., 2000).

Reaction time is another indicator of cognitive functioning and represents the speed at which individuals respond to stimuli. Slower reaction times may indicate reduced neural efficiency or difficulties in information processing (Jensen, 2006).

Young adulthood is a critical developmental stage for cognitive functioning because the brain continues to mature during this period. The prefrontal cortex, responsible for executive functioning, impulse control, and decision-making, continues to develop into the mid-twenties (Casey, Jones, & Hare, 2008). Disruptions to cognitive functioning during this stage may negatively influence academic performance, career development, and interpersonal relationships.

1.5 Attentional Effects of Vaping

Nicotine and other psychoactive substances present in vaping liquids may influence cognitive functioning. Nicotine affects neurotransmitters such as dopamine, acetylcholine, and norepinephrine, which play important roles in attention, learning, and mood regulation (Benowitz, 2010).

Although nicotine may temporarily increase alertness and concentration, repeated exposure may lead to dependence and long-term cognitive difficulties (U.S. Surgeon General, 2016). Exposure during young adulthood is particularly concerning because the brain is still developing. Nicotine may interfere with neural development processes such as synaptic pruning and neuroplasticity, potentially affecting impulse control and cognitive flexibility (Goriounova & Mansvelder, 2012).

Research suggests that frequent vaping may be associated with reduced concentration, increased distractibility, and poorer working memory performance (National Academies of Sciences, Engineering, and Medicine, 2018). Withdrawal symptoms such as irritability and difficulty focusing may also negatively affect cognitive functioning (CDC, 2022).

1.6 Research Gap and Significance of the Study

Despite increasing global concern about vaping, research examining its physical and cognitive effects among Indian young adults remains limited. Most available studies are conducted in Western populations, and their findings may not fully apply to the Indian context due to cultural, social, and legal differences (WHO, 2020).

Furthermore, many studies focus on either physical health outcomes or psychological variables separately. Few studies examine both aspects together or compare vape users with non-users within the same population.

The present study aims to address this gap by examining differences in physical health and attentional processing between vape users and non-users among Indian young adults. The findings may contribute to a better understanding of vaping-related risks and support the development of prevention programs, awareness campaigns, and evidence-based health policies aimed at protecting the wellbeing of young adults.

2. REVIEW OF LITERATURE

Prakash et al. (2025) concerned with mental and cognitive implications of vaping which is an emerging epidemic in India. The authors discussed the addiction properties of nicotine and how it is associated with anxiety, depression, attention problems and cognitive impairment especially in teenagers whose brain is still maturing. They further add that vaping is often being presented as a harm-reduction approach, but is in the risk of becoming a way to enter into conventional cigarette smoking. This evaluation recommended the inclusion of the mental health approach to a population health policy that regulates vaping and emphasized the susceptibility of youthful users.

Gaur and Agnihotri (2025) conducted a scoping review to explore the evidence of the presence of heavy metals in cannabis vaporizers and aerosols. Such metals as zinc, aluminium, chrome, cadmium and copper were detected to be emitted into the inhaled aerosols of devices parts. One of the potential lung injuries associated with these metals was the use of electronics cigarettes leading to breathing damage. The authors emphasized regulatory loopholes, urgency of improving the design of devices, packaging transparency, and further research of systemic health effects even when the overall causation of medical effects was not identified.

Pedregosa et al. (2025) to investigate the effects of long-term transcranial Doppler measurement of electricity smoking on the cerebral functions. The authors of the investigation stated that long-term vapers were significantly less developed in cerebral vasomotor reactivity as compared with non-users, and it is strongly associated with cumulative exposure to vaping. Based on these findings, chronic smoking could increase the effects of mortality, neurocognitive disorder, and cerebrovascular disease. The authors recommended bigger prospective studies in order to confirm causation and explain processes.

Hamdan (2025) studied the neurological consequences of the use of e-cigarettes in the long-run and acute symptoms. Some of the common side effects included headache, dizziness, anxiety, sadness, insomnia, and aggravated seizures. The review was centered to the effects of nicotine on the limbic-dopaminergic system which causes neuroinflammation, addiction, and cognitive impairment. By highlighting the clinical importance of preventing early the author accentuated that adolescents are particularly vulnerable due to neurodevelopment at this age.

Vadalia and Yadav (2025) studied how the usage of e-cigarette, cannabis, and nicotine influences neurophysiology and vision of individuals with brain injuries (TBI). Based on the analysis, 72 studies summarized substance abuse effects may exacerbate the deficits of cognition or visual impairment or difficulties in recovery in TBI patients. The authors emphasized the necessity of substance use screening in neurorehabilitation facilities as they pointed to the toxicity of smoking and vaping as a way of inhibiting neuronal recovery processes.

Krishna et al. (2024) inflamed quality-of-life and long-term cardiopulmonary outcomes of cigarette smokers, electronic-cigarette smokers, dual and non-smokers. The study, comparing smoking and vaping to control conditions, found that both methods have negative effects on the cardiovascular and respiratory system, and this effect was observed both on pulmonary functionality and quality of life under the influence of the methodology applied to the various groups of users. Dual users did not perform as well as exclusive users, which suggests the existence of cumulative health risks. Most of the time e-cigarettes are considered as safer options, but the authors were keen to point out that the long-term cardiopulmonary effects of the use of e-cigarettes also warrant concern. The authors have highlighted the importance of the long-term research to explain the impact on chronic health in different patterns of consumption.

Kaur et al. (2024) studied the effect of tele physiotherapeutic breathing yogic pranayama on young Indian smokers on their cardiovascular parameters and functional ability. Improvement in the blood pressure, heart rate, and cardiac workload was statistically significant after interventions but no statistically significant difference was demonstrated in the six-minute walk distance. The cardiovascular indicators of vapers were worse at baseline compared to control. The findings highlight the possible beneficialness of preventive approaches focused on physiotherapy since they point to the fact that the incidence of certain cardiovascular risks associated with vaping could be decreased using structured breathing therapies. The authors have noted, however, these interventions do not address the actual cause of the adverse outcomes of vaping.

Mohapatra et al. (2024) carried out an extensive survey to research the relationship between vaping and concerns about weight control in young adults and adolescents. The authors found out that e-cigarette use was associated with increased body image concern particularly among women, and a section of users believed that vaping could help them to control their weights. Relative harm decrease and flavoured goods were further encouraged as reasons to use. In the study, the necessity of further research that can help to understand long-term health consequences and reported potential cardiovascular and psychological risks mentioned.

3. METHODOLOGY
3.1 Aim of the Study
The present study aims to compare the physical health functioning and attentional processing of vape users and non-users among young adults in India. The study seeks to determine whether the regular use of electronic cigarettes is associated with poorer physical health and lower attentional functioning compared to individuals who do not use vaping products. By examining these differences, the research aims to provide a clearer understanding of the possible physical and cognitive consequences of vaping among young adults.

3.2 Objectives of the Study
The objectives of the study are as follows:
1. To assess the physical health functioning of vape users.
2. To assess the physical health functioning of non-users.
3. To determine the attentional processing of vape users.
4. To determine the attentional processing of non-users.
5. To compare the physical health functioning between vape users and non-users.
6. To compare attentional processing between vape users and non-users.
7. To examine the relationship between vaping behaviour and attentional processing among Indian young adults.

These objectives aim to provide a comprehensive understanding of the physical and cognitive outcomes associated with vaping behaviour.

3.3 Hypotheses
Based on the objectives and existing literature, the following hypotheses were formulated:
1. There will be a significant difference in physical health functioning between vape users and non-users.
2. There will be a significant difference in attentional processing between vape users and non-users.
3. Vape users will demonstrate poorer physical health functioning compared to non-users.
4. Vape users will show lower attentional processing compared to non-users.

These hypotheses were tested using appropriate statistical methods.

3.4 Variables of the Study
Independent Variable
Vaping Status
The independent variable in this study is vaping status, which refers to whether participants regularly use electronic cigarettes.
• **Vape Users:** Young adults who use electronic cigarettes at least once a week for a minimum of six months.
• **Non-Users:** Young adults who have never used electronic cigarettes or nicotine vaping products.

Dependent Variables

1. Physical Health Functioning
Physical health functioning refers to the general physical wellbeing of participants, including fatigue, sleep disturbances, stress-related physical symptoms, and overall health perception. This variable represents the potential physical impact of vaping among young adults.
Physical health functioning was measured using the General Health Questionnaire-12 (GHQ-12).

2. Attentional Processing
Attentional processing refers to cognitive abilities related to attention, awareness, and mental efficiency in everyday functioning. It includes focus, working memory, decision-making, and awareness of present experiences.
Attentional processing was measured using the Mindful Attention Awareness Scale (MAAS – Trait).

3.5 Research Design

The present study employed a comparative research design. This design was used to examine differences in physical health functioning and attentional processing between vape users and non-users. Data were collected using standardized self-report questionnaires. Statistical analysis was used to determine whether significant differences existed between the two groups.

3.6 Sample

The study included a sample of 147 Indian young adults, divided into two groups:
• 70 vape users
• 77 non-users

Participants were between 18 and 30 years of age, representing a stage where physical health and cognitive functioning are important developmental factors. Most participants were college students or young adults living in urban areas.

A purposive sampling method was used to recruit participants who met the criteria for vape users or non-users. This sampling method ensured that participants clearly represented the two behavioural groups required for comparison.

Inclusion Criteria

Participants were included in the study if they met the following criteria:
• Indian citizens aged 18–30 years
• Ability to read and understand Hindi or English
• Regular use of e-cigarettes (for vape users) at least once per week for six months
• Willingness to participate voluntarily and provide informed consent

These criteria ensured that participants were comparable and able to provide accurate responses.

Exclusion Criteria

Participants were excluded if they had:
• Neurological disorders affecting attention
• Serious medical conditions affecting physical health
• Current use of psychoactive substances other than nicotine
• History of major head injury affecting cognitive functioning
• Past diagnosis of severe psychiatric disorders

These criteria helped reduce confounding variables and improved the validity of the study.

3.7 Description of Tools Used

Apparatus 1: General Health Questionnaire-12 (GHQ-12)

The General Health Questionnaire-12 (GHQ-12) is a widely used self-report screening tool designed to assess general health and psychological wellbeing in non-clinical populations. It is a shortened version of the original General Health Questionnaire and is commonly used in health research.

The GHQ-12 consists of 12 items that measure aspects such as concentration difficulties, sleep problems, stress, decision-making ability, self-confidence, and general wellbeing. Participants rate each item using a four-point Likert scale based on how they felt during the past few weeks.

The scale is typically scored using the Likert scoring method (0-1-2-3), where higher scores indicate poorer general health or greater psychological distress. The GHQ-12 has been widely used in epidemiological and psychological studies and has demonstrated strong reliability and validity across different populations.

In the present study, the GHQ-12 was used to assess the general health functioning of the participants.

Apparatus 2: Mindful Attention Awareness Scale (MAAS)

The Mindful Attention Awareness Scale (MAAS) is a self-report instrument used to measure trait mindfulness and attentional awareness in daily life. It was developed by Brown and Ryan (2003) and is widely used in psychological research.

The MAAS contains 15 items describing situations related to lapses in attention, such as acting automatically or being unaware of present experiences. Participants respond using a six-point Likert scale ranging from 1 (almost always) to 6 (almost never).

All items are negatively worded, meaning they describe a lack of mindfulness. Higher scores indicate greater attentional awareness and present-moment focus. The final score is calculated by taking the mean of all 15 items.

The MAAS has demonstrated good reliability and validity in various research settings and is commonly used in studies related to mindfulness, mental wellbeing, and cognitive functioning.

3.8 Procedure

Before beginning the study, ethical approval was obtained from the appropriate institutional authority. Ethical guidelines for research involving human participants were strictly followed.

Participants were recruited from colleges and urban communities using purposive sampling. A Demographic Information Sheet was first administered to collect details such as age, gender, educational background, and vaping behaviour.

Based on this information, participants were categorized into two groups: vape users and non-users. After classification, participants completed the General Health Questionnaire-12 (GHQ-12) to assess their general health functioning.

Next, the Mindful Attention Awareness Scale (MAAS) was administered to measure attentional awareness and present-moment focus in everyday activities. Clear instructions were provided before the questionnaires were completed.

The questionnaires were administered in a quiet and comfortable environment. Participants were given adequate time to complete the measures, and any doubts were clarified. Responses were recorded anonymously to ensure confidentiality.

The collected data were stored securely and later analysed using appropriate statistical methods to examine differences between vape users and non-users in terms of physical health functioning and attentional processing.

4. RESULT

4.1 DESCRIPTIVE STATISTICS: FREQUENCY DISTRIBUTIONS

4.1.1. Frequencies Of Gender

Gender	Counts	% Of Total	Cumulative
Female - 1	65	44.2%	44.2%
Male - 2	82	55.8%	100%

The sample was 65 female participants (44.2) and 82 male participants (55.8). This distribution shows that there are a few more male participants rather than female participants in the study.

4.1.2. Frequencies Of Education

Education	Count	% Of Total	Cumulative %
1	7	4.8%	4.8%
2	92	62.6%	67.3%
3	47	32.0%	99.3
4	1	0.7%	100.0%

There were participants in four levels of education, and most of the participants (62.6) belonged to category 2. The smaller values were seen in category 1, 3 and a low percentage in category 4.

4.1.3. Frequencies Of Vape Users

Vape User?	Counts	% Of Total	Cumulative %
Yes – 1	70	47.6%	47.6%
No - 2	77	52.4%	100.0%

Forty-seven point six per cent of the participants vaped whilst 52.4 per cent did not. This shows that there is a marginally higher number of non-vape users than the vape users in the sample.

4.2 Descriptives
Descriptive Statistics of Demographic Variables

	Gender	Education	Vape User?
N	147	147	147
Missing	0	0	0
Mean	1.56	2.29	1.52
Median	2	2	2
Standard Deviation	0.498	0.561	0.501
Minimum	1	1	1
Maximum	2	4	2

The descriptive statistics indicate the comprehensive data on all the variables. Mean values represent distributions representative of gender, education and status of vaping which are of moderate variability as indicated by the standard deviations.

4.3 Independent Samples T-Test
Group Differences Assessed Through Independent Samples T-Test

Independent Samples T-Test

		Statistic	df	p
GHQ_TOTAL	Student's t	24.3	145	<.001
	Mann-Whitney U	74.5		<.001
MAAS_TOTAL	Student's t	-24.6[a]	145	<.001
	Mann-Whitney U	115.5		<.001

Note. $H_a \mu_1 \neq \mu_2$

[a] Levene's test is significant ($p < .05$), suggesting a violation of the assumption of equal variances

The independent samples t test have shown the difference in the amounts of both GHQ and MAAS scores and the p-values in the independent samples t-test are less than.001, which means there are statistically significant differences between the two compared groups.

4.4 Assumptions
Assumption Testing: Normality (Shapiro–Wilk Test).

Assumptions

Normality Test (Shapiro-Wilk)

	W	p
GHQ_TOTAL	0.934	<.001
MAAS_TOTAL	0.839	<.001

Note. A low p-value suggests a violation of the assumption of normality

The results of the Shapiro-Wilk test showed that the p-values of GHQ and MAAS were significant, which shows they do not follow the normality assumption and the data are not normally distributed.

5. DISCUSSION

The present study examined differences and patterns in psychological and demographic characteristics using the Mindful Attention Awareness Scale (MAAS) and the General Health Questionnaire (GHQ). The findings were interpreted using frequency distributions, descriptive statistics, assumption testing through the Shapiro–Wilk test, and independent samples t-tests.

The frequency analysis showed that the sample consisted of 147 participants, including 65 females (44.2%) and 82 males (55.7%). Although slightly more males were represented, the gender distribution remained reasonably balanced, which strengthens the reliability of comparative analysis. Educational background was largely concentrated in the middle categories, with most participants belonging to category 2. Very few respondents fell into categories 1 and 4, suggesting that the sample mainly consisted of individuals with similar educational backgrounds, likely college students or young adults in the early stages of their careers. In terms of vaping behaviour, 52.4% of participants reported that they did not vape, while 47.6% reported vaping. This near-equal distribution provides a strong basis for comparing vape users and non-users.

Descriptive statistics further clarified the sample characteristics. The gender variable showed a mean of 1.56 with a standard deviation of 0.498, confirming the binary nature of the variable. The mean education score of 2.29 indicated that most respondents belonged to the middle educational categories, with moderate variability. The mean vaping status of 1.52 also reflected the nearly equal proportion of vape users and non-users. Importantly, no missing values were observed in the dataset, indicating strong data integrity.

The Shapiro–Wilk test revealed that both MAAS and GHQ scores significantly deviated from normal distribution (p < .001). Such non-normality is common in psychological research, where responses often cluster around certain levels of distress or awareness. Because of this violation of normality

assumptions, both parametric and non-parametric statistical approaches were considered.

Independent samples t-tests revealed significant differences between groups for both GHQ and MAAS scores (p < .001). Higher GHQ scores indicated greater psychological distress, whereas lower MAAS scores reflected reduced mindfulness or attentional awareness. These findings suggest meaningful psychological differences between the compared groups.

Overall, the results indicate that variations in psychological distress and mindfulness may be associated with behavioural or demographic characteristics. If vaping status served as the grouping variable, the findings may suggest that vape users experience greater psychological distress and lower attentional awareness compared to non-users. These results highlight the potential psychological implications associated with vaping behaviour among young adults.

6. CONCLUSION

6.1 Summary of Key Findings

The present study examined psychological differences among participants using the General Health Questionnaire (GHQ) and the Mindful Attention Awareness Scale (MAAS). The sample consisted of 147 participants with a relatively balanced gender distribution (44.2% females and 55.8% males). Most participants belonged to middle educational categories, indicating a relatively homogeneous sample of young adults. Vape users represented 47.6% of the sample, allowing meaningful comparison with non-users.

The Shapiro–Wilk test indicated that GHQ and MAAS scores were not normally distributed. However, both independent samples t-tests and Mann–Whitney U tests revealed significant group differences (p < .001). Higher GHQ scores suggested greater psychological distress, while lower MAAS scores reflected reduced mindfulness and attentional awareness in one group. These findings suggest that behavioural factors such as vaping may be associated with increased psychological distress and lower attentional functioning.

6.2 Limitations and Future Directions

The study had several limitations, including a non-representative sample, reliance on self-report measures, and a

cross-sectional design that limits causal interpretation. Future research should include more diverse samples, longitudinal designs, and objective cognitive measures to improve reliability. Controlling for factors such as mental health history, lifestyle behaviours, and stress levels would also strengthen future studies. Additionally, awareness programs targeting young adults may help address potential psychological risks associated with vaping.

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