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Adolescents' and Young Adults' Perceptions of Risks and Benefits Differ by Type of Cannabis Products

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Abstract

Introduction: Cannabis use patterns among adolescents and young adults (AYAs) have changed recently, with increasing use of non-combustible cannabis products. Little is known about perceived risks or benefits related to non-combustible products (e.g., vaporized and edible cannabis). We examined whether AYAs' perceived risks and benefits differ across four cannabis products, and by use status.

Methods: We conducted a survey of 433 California AYAs (M_{age} = 18.9 years old, 66.5% females) during 2017–2018. We compared a variety of perceived risks and benefits corresponding to short-term and long-term use of each product (combustible, blunt, vaporized, and edible cannabis), and between ever and never users.

Results: Participants perceived combustible cannabis and blunts conferred the greatest risk for short-term (bad cough, trouble catching breath) and long-term (lung disease, oral and lung cancer, and heart attack) health outcomes and short-term social risks (friends upset, getting into trouble). These products were also perceived to have greater short-term and long-term benefits (i.e., reducing mental health problems) than vaporized and edible cannabis. The most common perceived risks were "get into trouble" and "become addicted." The most common benefits were "feel high or buzzed" and "feel less anxious." Ever cannabis users perceived less risks and greater benefits related to cannabis use than never users.

Conclusions: AYAs differentially perceived risks and benefits related to use of four cannabis products. Public health and education efforts should address both perceived and real risks and benefits of specific cannabis products to prevent cannabis use among AYAs.

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Keywords

marijuana; cannabis; substance use; adolescents and young adults; perception

1. Introduction

Cannabis (marijuana) is the most commonly used federally illicit drug by U.S. adolescents and young adults (AYAs) (Hammond et al., 2020). One in five 12th grade students reported past-month use of cannabis and 7% reported daily use (Johnston et al., 2021). In the last few years, there has been an evolving landscape of cannabis products on the market, including various combustible (e.g., joint, pipe, bong), blunts (a form of cannabis and tobacco co-use in which combusted cannabis is rolled in a cigar leaf), vaporized (e.g., vaping devices with THC oil or wax), and edible products (e.g., food products made or infused with cannabis). Although smoking cannabis remains the most popular mode of consumption among AYAs (Nguyen et al., 2019), studies indicate a rise in use of non-smoked cannabis products (Hammond et al., 2020), particularly vaporized cannabis (Miech et al., 2020), among AYAs. As cannabis use in this developmental period poses concerns of negative effects on brain development and mental function (Hammond et al., 2020), preventing AYA cannabis use in all forms is of public health importance.

Research shows that AYAs' perceptions of cannabis is a major driver of use, with low perceived risks associated with initiation and continued use of cannabis (Parker & Anthony, 2018). Concurrent with the rise in use, AYAs' perceived risks of cannabis have steadily declined over the past decade (Johnston et al., 2021). The expanding legalization of cannabis nationwide may increase acceptability and ease of access among AYAs (Hammond et al., 2020). Despite AYAs reporting using various forms of cannabis (Nguyen et al., 2019), the extant literature predominately focuses on their perceptions of health risks associated with combustible cannabis, or "marijuana" in general. Lacking are studies concerning AYAs' perceptions associated with non-combustible products and with blunts. In addition, prior research has asked about perceptions of more general outcomes (e.g., harmfulness to health) rather than of specific risk (e.g., having cough) or benefit outcomes (e.g., looking cool). Such nuanced data on specific perceived risks and benefits regarding both health and social impacts across product types could inform the development of tailored messages and educational content for cannabis use prevention (McKelvey et al., 2021).

To address these gaps, we analyzed cross-sectional data collected among 433 California AYAs (16–22 years old) during 2017–2018. According to the 2019 Youth Risk Behavior Survey, California adolescents had lower prevalence of ever (29.9%) and current (17.1%) use of cannabis compared to national estimates of adolescent cannabis use (36.8% and 21.7%, respectively) (Centers for Disease Control and Prevention, 2019). However, as California is considered the largest legal cannabis market in the US after legalization occurred in January 2018 (Orenstein & Glantz, 2018), cannabis-related data in this state provide important information since policies pioneered in California are often adopted by other states, and so may reflect and inform future use patterns and drivers. This study examined perceptions of not only risks but also benefits related to short-term and long-term

use of different cannabis products (i.e., combustible, blunts, vaporized, and edible cannabis). Given that blunts are a well-documented form of co-use of cannabis and tobacco among AYAs, and previous research showing different perceptions related to blunts and other combustible cannabis products (e.g., joints) (Kong et al., 2018), we examined perceptions related to blunts and other forms of combustible cannabis separately. We also compared perceptions between participants who had ever used cannabis and those who had never used cannabis. Understanding AYAs' perceived risks and benefits across different types of cannabis products and by use status is critical to inform public health and education messaging strategies aimed at preventing and reducing use of all forms of cannabis.

2. Methods

2.1. Designs and Participants

An online survey administered by Qualtrics (Provo, UT) was conducted during October 2017 – April 2018, as Wave 5 of a longitudinal tobacco-related perceptions study among students recruited from 10 racially/ethnically and socioeconomically diverse high schools across California (Gorukanti et al., 2017). The analytic sample included 433 students (mean age=18.9, SD=1.6; 66.5% female) with diverse race and ethnicity (26.5% Non-Hispanic White, 26.9% Non-Hispanic Asian/Pacific Islander, 11.1% Non-Hispanic Multiracial/Other, and 35.5% Hispanic). More than half of our sample (51.2%) reported ever use of any tobacco. Assent/consent forms were obtained from participants and their parents/guardians. The study was approved by the Stanford University's Institutional Review Board.

2.3. Measures

Participants were asked, "*During your entire life, how many times have you ever [smoked marijuana, vaped marijuana, smoked blunts, ingested edibles]?*" Never users were those reporting never use of any cannabis products, while ever users were those reporting use of any cannabis product at least once.

Cannabis-related perceptions of short- and long-term health and social risks and benefits were measured separately (McKelvey et al., 2021). To assess perceptions of short-term outcomes, participants were asked, "*Imagine that you just began using [a specific cannabis product]. If you use the product 2 to 3 times each day, what is the chance, from 0 to 100%, that you will [outcomes listed; e.g., have a bad cough, get into trouble]?"* For assessments of long-term risks, participants were asked, "*Imagine now that you continue to use [a specific cannabis product] 2 to 3 times a day for the rest of your life, what is the chance, from 0 to 100%, that you will [e.g., have lung cancer, become addicted]?*" Participants then indicated the percent chance (from 0% to 100%) of getting an outcome. See Tables for the list of short- and long-term outcomes assessed. The measures and scenarios used to assess perceived risks and benefits were based on a number of other studies assessing perceived risks and benefits of tobacco and cannabis use, as well as pilot testing with adolescents from similar age and demographic groups as those included in this study (McKelvey et al., 2021; Roditis et al., 2016; Song et al., 2009).

2.3. Analysis

Means and standard deviations were computed for each perception item. We used generalized linear models to account for correlation of students' responses clustered within school and unbalanced group sizes. Outcomes were continuous variables (0–100%) indicating perceived chance of having a given health or social risk if using cannabis. For each perception outcome, we estimated a model comparing means of that outcome among four cannabis products (a categorical independent variable), and another model of that outcome between ever and never cannabis users (a binary independent variable). All models were adjusted for age and sex. There were six pairwise comparisons among four cannabis products. The statistical significance across pairwise comparison tests was controlled by using the Tukey-Kramer method with p-values adjusted based on the studentized range distribution (Kramer, 1956). All tests were two-tailed with a significance level of α less than 0.05. Analyses were conducted using SAS v9.4.

3. Results

3.1. Ever use of cannabis products

Of 433 participants, 48.3% reported ever using at least one type of cannabis products. Among those, 90% reported ever use of two or more cannabis products. Combustible cannabis was the most common product ever used (44.6%), followed by blunts (39.3%), edibles (36.7%), and vaporized cannabis (34.2%) (Table 1).

3.2. Perception of risks across cannabis products

Among the risks assessed (Table 1), the most common perceived short-term and long-term risks were "get into trouble" and "become addicted," respectively. Across the cannabis products, perceived percent chance of experiencing the short- and long-term risks was highest for blunts and combustible cannabis, followed by vaporized cannabis, and the lowest for edible cannabis. Almost all of the pairwise comparisons of perceived health risks (i.e., bad cough, breathing trouble, cancer, addiction) among the cannabis products were significantly different. Comparisons between combustible cannabis and blunts were not significantly different for most of the perceived health risks. The only significant difference between the two products was that long-term use of blunts was perceived to have a higher likelihood of resulting in lung cancer and heart attack than long-term use of other combustible cannabis products. Combustible cannabis and blunts were perceived to have greater risks than vaporized cannabis for all the health outcomes, except for having a heart attack. Vaporized cannabis was perceived to have greater health risks than edibles, except for having heart attack. For perceived short-term risk of experiencing social problems (i.e., get into trouble, friends upset) if used cannabis, the only significant comparison was between blunts and edible cannabis, indicating that blunts were perceived as more likely than edible cannabis to lead to getting into trouble and having friends upset.

Compared to never users, ever cannabis users perceived less risk of getting lung cancer and experiencing social problems (i.e., get into trouble, friends upset) for the four cannabis products. Likewise, perceived risk of getting oral cancer was lower among ever users (vs. never users) for all types of cannabis products, except combustible cannabis. For edible

cannabis, ever users perceived lower short-term health risks (i.e., of getting a bad cough, having trouble catching breath) and addiction than never users. Likewise, ever users (vs. never users) perceived lower risk of having trouble catching breath and getting lung disease for vaporized cannabis, and lower risk of becoming addicted for combustible cannabis.

3.3. Perceptions of benefits across cannabis products

Among the benefits assessed (Table 2), the most common perceived short-term and long-term benefits from using cannabis were “feel high or buzzed” and “feel less anxious,” respectively. For pairwise comparisons of short-term benefits, combustible cannabis was perceived as having greater benefits of all the short-term benefits than vaporized cannabis, and having greater benefits for short-term mental health outcomes (feeling less stressed or anxious) than blunts and edibles. Combustible cannabis was also perceived as having greater benefits (feeling high or buzzed) than blunts. Participants thought that smoking combustible cannabis or blunts would be more likely to result in someone “looking cool” than using vaporized or edible cannabis. Participants perceived feeling high or buzzed from using edible cannabis more than from using vaporized cannabis. Regarding long-term benefits, combustible cannabis was perceived as reducing anxiety and depression better than all other cannabis products.

Ever cannabis users (vs. never users) perceived greater benefits of using cannabis on reducing mental health problems for using all types of cannabis products. Compared to never users, ever users also perceived greater benefits of having better concentration for all types of cannabis, except for vaporized cannabis. In addition, ever users (vs. never users) perceived greater benefits of looking cool for combustible cannabis and blunts, while they perceived greater benefits of feeling high or buzzed for edible cannabis.

4. Discussion

While combustible cannabis and blunts remain the most common forms of AYA cannabis use, increasing rates of use of vaporized and edible cannabis have been observed (Hammond et al., 2020). However, most studies on perceptions of cannabis focus on combustible cannabis, or “marijuana” more generally. This study extends the literature by examining AYAs’ perceptions of short-term and long-term risks and benefits of cannabis use, with a focus on different types of cannabis products (combustible, blunt, vaporized, and edible cannabis), and between ever and never users of cannabis. The main finding is that AYAs differently perceive risks and benefits across the four cannabis products, and ever cannabis users generally perceive lower risks and greater benefits of cannabis use than never users.

Consistent with previous studies among AYAs (Hammond et al., 2020; Nguyen et al., 2019), the most common cannabis products used in our sample were combustible cannabis and blunts. Interestingly, these products on average were perceived to have greater short- and long-term risks than vaporized and edible cannabis. However, it should be noted that ever cannabis users perceived less risks of using these products than never users. The paradox between perceived risk and actual use of combustible cannabis and blunts may be explained by another finding that AYAs also had greater perceived benefits related to these products. These findings indicate that AYAs’ use of combustible cannabis and blunts are based on a

balance of both their perceived risks and perceived benefits of these products, highlighting the role of these sets of opposite perceptions in AYAs' behavioral decision-making (Halpern-Felsher et al., 2004; Song et al., 2009).

Prevention and intervention efforts often focus on communicating health risks related to cannabis use rather than social risks (e.g., friends upset, getting into trouble), yet such health outcome-focused strategies may not always be effective for young populations (Substance Abuse and Mental Health Services Administration (SAMHSA), 2021). Indeed, among the perceptions of risks assessed in our study, the most common perceived short-term and long-term risks were social negative outcomes (i.e., getting into trouble) and addiction, respectively. Likewise, a previous qualitative study found that adolescents expressed a concern about addiction and social impacts of cannabis use (e.g., losing friends or impacting family relationships) (Skinner et al., 2017). This finding suggests that, along with communicating about health risks, increasing AYAs' awareness of social risks and the addictive nature of cannabis use may be an additional focus to deter AYA cannabis use, as has been shown with other research including both social and health risks for tobacco prevention (Gaiha et al., 2021; Liu et al., 2020). In addition, our study did not identify whether our participants had experienced any health or social risks related to cannabis. Future research should elucidate actual consequences of specific perceived risks on cannabis use among AYAs.

In addition to considering perceived social risks in research and prevention efforts, the perceived benefit construct is also part of many health behavior models (e.g., the Health Belief Model) (Fadaei et al., 2020), yet rarely included in studies on cannabis use perceptions. We found the most common perceived long-term benefit among AYAs was "feel less anxious." Beyond recreational purposes, AYAs report using cannabis as self-medication to cope with their anxiety and other mental health issues (e.g., depression, stress) (Hammond et al., 2020). Our finding that AYAs perceived cannabis use as beneficial to their mental health is particularly important given that recent national data report a concerning trend in poor mental health in this age group (Centers for Disease Control and Prevention, 2020). Furthermore, recent reviews indicate that AYA cannabis use is associated with poorer outcomes among those with mood and anxiety disorders (Hammond et al., 2020) and increased risk for developing major depression and suicidality (Gobbi et al., 2019). Our finding highlights a need for correcting AYAs' misperception regarding benefits of cannabis use and educating AYAs on mental health risks related to use of cannabis. In addition, including screening for mental health problems into routine clinical care and integrating resilience training (e.g., family or school support) in prevention programs may offer AYAs better ways to cope with their mental health issues (Mesman et al., 2021), which in turn may prevent their cannabis use.

We also found that AYAs perceive use of edible cannabis as the least harmful to their health compared to other types of cannabis use. Legalization of recreational cannabis use and permission of home cultivation have been associated with a higher likelihood of AYAs using edible cannabis (Borodovsky et al., 2017). This changing policy landscape coupled with low perceived risks of edibles call for more attention on preventing use of this product among AYAs.

Collectively, our study has implications for public health efforts to prevent cannabis use and its negative health effects on AYAs. Mass media campaigns and educational programs should address both perceived risks and benefits of cannabis use and consider all types of cannabis products. Effective communication strategies may be those that increase perceptions of both health and social risks and correct misperceptions of mental health benefits related to cannabis use. As AYAs' perceptions differ by cannabis product type, messages should be tailored to specific cannabis products, especially non-combustible products, rather than focus on cannabis use generally. For example, contents on vaporized cannabis could highlight risk of vaping-related lung injuries, while those on edible cannabis could highlight risk for over-consumption and intoxication.

This study has several limitations. Given the exploratory and cross-sectional nature of this study, we could not examine a causal relationship between perceived risks/benefits and cannabis use behavior. Longitudinal studies have found a bidirectional relationship between perceptions and tobacco use, in which perceived risks and benefits predicted adolescent cigarette smoking (Song et al., 2009), and on the other hand, AYAs' personal smoking experience decreased their perceived risks and increased their perceived benefits of cigarette use over time (Morrell et al., 2010); however, less is known for the longitudinal relationship between perceptions and AYA cannabis use. In addition, we did not collect data on potential confounders (e.g., physiological or mental health conditions, parental supervision, home situation) which may have affected participants' perceived risks and benefits of cannabis use. Longitudinal and more comprehensive data are needed to better understand how the perceptions impact initiation and continued use of cannabis among AYAs. Findings from our small school-based sample in California may not generalize to other young populations or geographic locations that have different demographic characteristics and cannabis-related policies. Self-reported data might be subject to recall and social desirability biases. The small sample size did not allow us to examine perceived risks and benefits in a more comprehensive set of user categories (e.g., occasional vs. frequent cannabis users, single vs. multiple product users). Future research should examine perceived risks and benefits among these groups of cannabis users to elucidate an association between cannabis-related perceptions and use patterns.

In conclusion, this study indicated that AYAs' perceptions of risks and benefits differ by cannabis product and use status, with greater perceived risks and benefits for combustible cannabis and blunts than for vaporized and edible cannabis. Prevention efforts should take into account perceptions of both risks and benefits and tailor educational messages to specific products to prevent all forms of AYA cannabis use.

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Table 1:

Perceptions of short-term and long-term risks across cannabis products among California adolescents and young adults aged 16–22 (N=433)

	Combustible cannabis	Vaporized cannabis	Blunts	Edible cannabis
Ever use, N (%)	193 (44.6%)	148 (34.2%)	170 (39.3%)	159 (36.7%)
Short-term risks	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
Get a bad cough				
Total[acdef]	58.1 (33.45)	47.3 (35.38)	59.4 (33.47)	25.6 (33.03)
Never users	60.6 (33.86)	51.3 (35.41)	61.8 (33.79)	33.3 (36.81)*
Ever users	56.6 (32.87)	45.2 (35.24)	57.9 (32.86)	19.7 (29.00)
Have trouble catching breath				
Total[acdef]	58.9 (33.41)	50.9 (35.11)	59.9 (33.13)	30.9 (35.86)
Never users	62.1 (34.39)	55.8 (35.23)*	62.2 (34.37)	40.0 (38.90)*
Ever users	56.7 (31.15)	46.6 (34.11)	58.2 (31.06)	22.7 (31.51)
Get into trouble				
Total[f]	59.7 (39.39)	57.9 (39.94)	59.8 (39.64)	57.4 (40.15)
Never users	75.1 (80.28)*	67.7 (39.50)*	70.7 (38.23)*	66.2 (39.31)*
Ever users	49.1 (37.16)	46.9 (37.37)	48.4 (37.52)	46.9 (38.47)
Friends upset with you				
Total[f]	48.5 (41.85)	48.5 (41.96)	49.6 (41.78)	47.8 (41.76)
Never users	62.9 (40.76)*	62.9 (41.06)*	64.6 (40.22)*	61.4 (41.17)*
Ever users	33.4 (37.67)	33.8 (37.68)	34.4 (37.87)	33.8 (37.59)
Long-term risks	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
Get lung disease (COPD)				
Total[acdef]	49.6 (33.17)	41.4 (33.24)	52.2 (35.01)	23.8 (30.88)
Never users	54.5 (33.82)	46.9 (33.21)*	54.9 (33.11)	34.4 (30.75)
Ever users	45.4 (32.00)	36.8 (32.95)	49.9 (37.56)	20.1 (29.64)
Get lung cancer				
Total[abcdef]	48.8 (33.46)	39.7 (33.17)	51.7 (32.68)	25.9 (31.49)
Never users	54.7 (33.95)*	47.1 (34.64)*	56.4 (33.66)*	34.6 (34.56)*
Ever users	43.9 (31.57)	33.7 (30.05)	48.0 (30.86)	19.4 (27.75)
Get oral (mouth) cancer				
Total[acdef]	46.2 (33.37)	37.5 (33.07)	49.1 (33.03)	29.8 (32.73)
Never users	51.5 (33.71)	42.4 (34.19)*	53.0 (34.17)*	38.3 (34.46)*
Ever users	47.0 (38.45)	33.5 (31.82)	46.0 (31.94)	22.1 (29.24)
Have a heart attack				
Total[bcf]	37.6 (32.01)	35.4 (31.34)	40.4 (32.60)	32.3 (31.58)
Never users	41.0 (33.18)	41.8 (56.33)	42.0 (34.27)	35.5 (32.52)

Ever users	33.5 (29.87)	32.6 (30.87)	38.2 (30.45)	28.9 (29.74)
Become addicted				
Total[acdef]	56.5 (36.04)	52.5 (35.77)	56.5 (35.61)	49.6 (36.79)
Never users	63.4 (35.79)*	58.3 (35.78)	61.9 (36.12)	58.0 (36.49)*
Ever users	50.6 (35.49)	48.1 (35.59)	52.4 (34.85)	42.6 (35.94)

Significant pairwise comparison:

a = Combustible vs. Vaporized;

b = Combustible vs. Blunt;

c = Combustible vs. Edibles;

d = Vaporized vs. Blunt;

e = Vaporized vs. Edibles;

f = Blunts vs. Edibles.

Significant difference between never users vs. ever users: *

Table 2:

Perceptions of short-term and long-term benefits across cannabis products among California adolescents and young adults aged 16–22 (N=433)

	Combustible cannabis	Vaporized cannabis	Blunts	Edible cannabis
Short-term Benefits	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
Feel high or buzzed				
Total[abe]	75.8 (31.20)	71.9 (31.76)	72.8 (32.22)	75.3 (31.18)
Never users	74.2 (31.43)	70.4 (32.48)	71.2 (33.65)	72.7 (33.06) *
Ever users	77.9 (28.53)	74.6 (30.41)	75.5 (29.67)	78.6 (28.76)
Have better concentration				
Total[a]	12.2 (22.66)	10.2 (20.16)	11.1 (20.95)	9.8 (19.05)
Never users	8.8 (18.77) *	8.0 (17.96)	8.1 (17.46) *	7.6 (15.49) *
Ever users	15.9 (24.86)	13.0 (21.94)	14.7 (23.42)	12.7 (21.89)
Look cool				
Total[acdf]	16.5 (26.77)	12.9 (24.06)	15.2 (26.09)	12.7 (23.86)
Never users	12.5 (24.85) *	10.7 (23.83)	11.2 (22.85) *	10.9 (22.89)
Ever users	21.7 (28.89)	15.7 (24.85)	20.6 (29.14)	15.8 (26.22)
Feel less stressed				
Total[abc]	37.7 (34.09)	33.2 (33.24)	35.0 (33.57)	34.9 (33.63)
Never users	31.1 (32.87) *	27.7 (31.46) *	28.8 (32.20) *	29.1 (31.96) *
Ever users	45.5 (34.26)	40.2 (34.20)	42.5 (34.31)	42.3 (34.70)
Feel less anxious				
Total[abcd]	36.5 (33.36)	31.7 (32.03)	34.0 (32.71)	33.4 (32.70)
Never users	32.9 (34.18) *	27.5 (31.86) *	29.4 (32.71) *	30.6 (33.59) *
Ever users	41.9 (32.66)	37.0 (31.90)	40.4 (32.68)	37.5 (32.15)
Feel less depressed				
Total[a]	28.7 (31.94)	26.0 (31.20)	27.5 (31.50)	27.2 (31.37)
Never users	23.3 (30.61) *	20.1 (28.18) *	22.0 (29.84) *	22.2 (29.58) *
Ever users	33.9 (33.33)	32.0 (33.41)	36.7 (58.83)	32.5 (33.28)
Long-term Benefits	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
Feel less anxious				
Total[abc]	34.7 (34.27)	31.1 (32.15)	32.2 (33.15)	31.9 (33.00)
Never users	33.1 (34.86)	28.6 (31.62)	29.8 (33.18)	30.6 (33.39)
Ever users	38.2 (34.95)	34.8 (33.40)	36.4 (34.12)	35.0 (33.51)
Feel less depressed				
Total[abc]	29.0 (31.70)	25.2 (30.81)	26.8 (31.25)	26.3 (31.20)
Never users	25.0 (30.63)	22.4 (29.21)	22.9 (30.00)	23.7 (30.15)
Ever users	33.5 (32.73)	29.0 (32.47)	30.8 (32.24)	30.0 (32.71)

Significant pairwise comparison:

a = Combustible vs. Vaporized;

b = Combustible vs. Blunt;

c = Combustible vs. Edibles;

d = Vaporized vs. Blunt;

e = Vaporized vs. Edibles;

f = Blunts vs. Edibles.

Significant difference between never users vs. ever users: *