The Role of Attitudes in the Use of Tobacco, Alcohol, and Cannabis

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INTRODUCTION

Historically social groups have developed norms for the consumption of such ubiquitous substances as tobacco and alcohol (Schmidt & Room, 1999), in part because of health problems associated with tobacco and alcohol use (Bacon, 1951). A multi-national study showed that the misuse of alcohol contributes to about 4% of total mortality and 4-5% of disability-adjusted life-years (DALYs) (Rehm et al., 2009). Tobacco smoking has been shown to be a major predictor of lung cancer, COPD, and hypertension (Hackshaw, Law, & Wald, 1997), and second-hand smoking accounts for close to 1% of DALYs, with the majority of the impact consisting of lower respiratory infections in children (Jaakola, Oberg, Woodward, Peruga, & Pruss-Uston, 2011). Further, long-term cannabis use is associated with increased prevalence of addiction, reduced memory performance, and motor vehicle accidents (Filbey, McQueeny, DeWitt, & Mishra, 2015; Schuermeyer et al., 2015). In this context, preventing deleterious use of these substances has been a primary public health goal and an important subject of study for the behavioral sciences, including psychology.

Efforts at managing substance use target not only adults but also adolescents, given awareness that early use of substances can have severe lifelong effects. For example, age of first alcohol use has been confirmed to be a major risk factor for the development of alcohol misuse and related diseases in adulthood (DeWit, Adlaf, Offord, & Ogborne, 2000; B. F. Grant, Stinson, & Harford, 2001; Milivojevic & Covault, 2013; Morean & Corbin, 2012). Further, adolescent smokers suffer structural changes and dampened immunological responses in the respiratory system, making them chronically susceptible to respiratory infections (S. hee Park, 2011). Similarly, because cannabis is often consumed through smoking, the same negative outcomes presents for adolescent cigarette use apply to adolescent cannabis use (Brook, Stimmel, Zhang, & Brook, 2008).

This chapter focuses on attitudes related to alcohol, tobacco, and cannabis use due to well-documented associations among concurrent use of these substances and the facilitating effects of use one on the others. Smoking and alcohol use have been commonly associated with one-another (Hughes, 1993), habitual smoking and alcoholism are robustly associated (Drobes, 2002), and smoking or alcohol use have similar determinants (Grant, Wardle, & Steptoe, 2009). Adolescents who drink alcohol are more likely to initiate daily smoking (Torabi, Bailey, & Majd- Jabbari, 1993) and college student drinking and smoking behavior are also strongly related (Reed, Wang, Shillington, Clapp, & Lange, 2007). Additionally, early initiation of alcohol use is strongly associated with early initiation of cannabis use (Flory, Lynam, Milich, Leukefeld, & Clayton, 2004), the correlates of alcohol and cannabis use overlap, and each behavior predicts initiation of the other in the next six months (D'Amico & McCarthy, 2006). In a nutshell, given that patterns of substance use suggest mutual effects, common determinants, and concurrence, it is only natural to examine attitudes related to alcohol, tobacco, and cannabis use within the same chapter. Understanding attitudes regarding these substances is pivotal because of the well-established influence of attitudes on behavior. (Albarracín et al., 2005)

In the upcoming sections, we review (a) historical trends in attitudes and public policy around the use of alcohol, tobacco, and cannabis; (b) how attitudes toward tobacco, alcohol, and cannabis use have been measured; (c) the influence of attitudes on individual substance use; (d) how these attitudes are formed; and (e) interventions to prevent substance use and misuse. Since adolescents and adults follow different developmental trajectories in the formation of attitudes around substance use and in their reasons for substance use, we often address the literature for these two groups separately. Addiction management and "harder" drugs are not discussed as they are beyond the objectives of this chapter. To conclude the chapter, we discuss strength and weaknesses in current scholarship, and identify areas of future research.

PUBLIC ATTITUDES TOWARDS ALCOHOL, TOBACCO, AND CANNABIS USE

Attempts at understanding why people use substances and methods of curtailing use and preventing misuse have been the focus of various disciplines for most of the past century. In the United States, alcohol use has historically been a target due to opposition from religious movements, many of which received increased support between the 1800s and the early 1900s and culminated with the national ban on alcohol referred to as *prohibition* (Dupré, 2004). Prohibition was the most prominent large-scale effort to influence both behavior and attitudes toward alcohol use: Alcohol use dropped to 30% of its pre-Prohibition level and then slowly began to increase as illegal channels, such as hidden bars, became available. When Prohibition ended in 1933, alcohol consumption stabilized at 60-70% of pre-prohibition consumption of alcohol, suggesting that the policy had successfully deterred drinking (Miron & Zwiebel, 1991).

The end of Prohibition brought considerable interest in scientific research on alcohol, and publications about alcohol began in the 1940s. Most states elected to have the minimum drinking age set at 21, which has remained fairly stable and was nationally regularized by the National Minimum Drinking Age Act of 1984. Initial research on alcohol use was aimed at understanding both characteristics of users and reasons for use. Riley and Marden (1947) were among the first to conduct a national survey to examine patterns of alcohol consumption in the general population. Their findings suggested that educated, urban and male populations consumed more alcoholic beverages on average than did their uneducated, rural, and female counterparts. Other research during the same period examined cultural influences on alcohol use and the likelihood of alcohol misuse. This research uncovered large cultural variability in attitudes towards appropriate alcohol use, with some cultures treating alcohol as a part of only specific events (e.g., only to be drank during family meals) or disapproving of binge drinking (Lolli et al., 1952; Snyder, 1955). Advancements in statistical techniques enabled modeling of demographic factors that predict consumption (L. V Johnson & Matre, 1978). Studies then examined prevalence and

predictors of smoking and mainly found that alcohol consumption was related to being male, young, white, employed, and being a smoker (Midanik & Clark, 1994). Subsequent work has focused on preventing adolescent drinking and aiding people with alcohol dependence, as well as assessing whether cohort effects (e.g., Babyboomers vs. Gen. X) apply to past predictive findings (Castro, Barrera, Mena, & Aguirre, 2014; Moore et al., 2005).

Similar to alcohol, tobacco use steadily increased up until the early 1900s, when calls for regulation arose in response to seminal research about the effects of smoking. Western cultivation of tobacco began at the beginning of the 17th century and quickly became popular because of the stimulant effects of nicotine. Smoking came under scrutiny at the beginning of the 20th century, when alarming increases in lung cancer incidence suggested a relation with tobacco smoking (Doll & Bradford Hill, 1950). Particularly, US service members were given cigarettes en masse, which then was associated with an increase in addictions and lung cancer. In the middle of the 20th century, biological research confirmed dose-response links between smoking and lung cancer, fueling subsequent initiatives to both control and prevent further smoking (Doll & Peto, 1978; Levin , Goldstein, & Gerhardt, 1950; Proctor, 2012). Much like in the alcohol domain, initial research during the 1950s investigated individual attitudes towards smoking and perceptions of the risk associated with smoking. Notably, in 1954, 41% of respondents in a national US survey indicated that cigarettes were harmful (Gallup, 1972) and a separate study found that 43% of all US physicians smoked on a regular basis (Tegan, 1960). In 1964, the US Surgeon General released a report stating that smoking was a danger to public health (Service, 1979). The report was followed by the tobacco industry countering with advertising and public dissemination of pro-tobacco information, including denying negative health outcomes. Although health practitioner attitudes changed, Big Tobacco advertising was successful and led to documented improvements in attitudes towards

smoking, which forced major policy changes to decrease the industry's ability to advertise in public media and market tobacco to children.

Much like use of alcohol and tobacco, cannabis use has fluctuated significantly due to a combination of regulatory, medical, and sociological factors. Cannabis cultivation for analgesic purposes dates back to 2700 B.C (Touw, 1981). However, cannabis was not introduced into Western society until the 19th century, when European physicians began to publish results from human experiments (Frankhauser, 2002). By the end of the 19th century, medical use was empirically supported for sedation and analgesia and accompanied by nonmedical uses as well (Aldrich, 1997). However, the medicinal use of cannabis decreased in the 20th century due to highly variable outcome quality and the introduction of the more reliable aspirin. In addition, the *Marihuana Tax Act of 1937* imposed cumbersome requirements for prescription and heavy fines for prescribers if they made errors. Removal from medical use in the 1940s was followed by an increase in recreational use among Mexican immigrants followed by later popularization among young people (lifetime use prevalence increased from 5% in 1967 to 64% in 1978; Harris, 1978) when the psychotropic chemical in cannabis was identified in 1964 (Russo, 2006). Besides research to identify the neurological receptors of cannabis in the early 1990s (Zuardi, 2006), recent work on cannabis has concerned advocacy for legalization and systematic efforts to ensure efficacious and safe consumption. Similar to research on tobacco and alcohol, contemporary studies have examined both individual health (Grella, Cochran, & Mays, 2015) and public health consequences (Schuermeyer et al., 2015) in adults, as well as developmental issues related to cannabis use in adolescence (Meier et al., 2012). This ongoing research suggests that regulations similar to those on alcohol are likely necessary in order to protect adolescent health (Hopfer, 2014). There are also concerns that cannabis may act as a gateway drug to more problematic illicit substances, based on results from a national U.S sample (Fergusson, Boden, & Horwood, 2006).

MEASUREMENT OF SUBSTANCE USE ATTITUDES

Attitudes are evaluations of objects and behaviors (Albarracín et al., 2005; Albarracín et al., Volume 1), such as thinking that smoking is bad or that drinking wine is pleasant. Explicit attitudes are the more conscious evaluations that people can report in response to direct questions about an object or behavior. Implicit attitudes are measured more indirectly and involve more spontaneous associations between an object and good or bad, which are often not explicitly endorsed. This distinction is important, as explicit and implicit attitudes may correlate poorly for socially controversial issues, such as adolescent smoking or cannabis use (W. Hofmann, Gawronski, Gschwendner, Le, & Schmitt, 2005). Most of the scholarship about attitudes towards tobacco, alcohol, and cannabis has been conducted with explicit attitude measures, but some more recent work includes implicit measures.

Explicit Measures

The measurement of attitudes related to tobacco, alcohol, and cannabis should generally follow the measurement principles that Krosnick, Judd, and Wittenbrink (Volume 1) discuss. For example, semantic differential scales are flexible, bipolar, 7-point scales that require simply identifying an object or behavior to be rated and selecting rating scales among a set of commonly used anchors such as *good*/*bad*, *pleasant*/*unpleasant*, or *harmful*/*beneficial*. Therefore, it is appropriate for researchers to simply implement semantic differential scales for any measurement target. Selecting anchors such as *unwise*/*wise* and *good*/*bad* may be done easily by consulting the many pairs of adjectives that Osgood (1962) studied and documented. Once the adjectives are selected, questionnaires can be easily assembled and administered, and what is left is to verify if the scales have adequate internal consistency after the questionnaires have been conducted. A semantic differential scale measure of attitudes towards smoking used (Hanson, 1999) included the following items.

For me, to smoke cigarettes during the next month would be:
nice _____ : _____ : _____ : _____ : _____ : _____ : _____ : awful

extremely quite slightly neither slightly quite extremely

For me, to smoke cigarettes during the next month would be:
pleasant __ ___ : _____ : _____ : _____ : _____ : _____ : _____ not pleasant

extremely quite slightly neither slightly quite extremely

For me, to smoke cigarettes during the next month would be:
not fun at all _____ : _____ : _____ : _____ : _____ : _____ : _____ : a lot of fun
extremely quite slightly neither slightly quite extremely

These items had acceptable internal consistencies, as shown by Cronbach's αs of .68 for African Americans,.78 for Puerto Ricans, and.82 for non-Hispanic Whites. In fact, semantic differential scales almost always produce satisfactory psychometric results.

Likert and Likert-type scales are another highly flexible method in which any statement can be presented to respondents, who are asked to estimate their agreement on the following scale:

1	2	3	4	5
Strongly Disagree	Moderately Disagree	Neither Agree nor Disagree	Moderately Agree	Strongly Agree

For example, Xu and colleagues (2015) presented the item "Smoking is pleasurable" to a sample of college students who responded if they agreed, disagreed, or were neutral on the subject. Further, similar, Likert-like scales have been used to measure attitudes towards smoking-related policies. For example, Lund (2016) used a 1 to 5 scale from *no support* to *full support* to gauge Norwegians' attitudes towards policies designed to reduce cigarette availability. The introduction to the questions was: "Several new tobacco control strategies may be implemented to reduce the health risk from tobacco smoking in society. What is your opinion if the government were to implement these regulations on smoking behavior?" This explanation was followed by a list of policies including "remove duty-free quota on cigarettes completely

when entering Norway," "increase cigarette taxes," and "decrease the number of cigarette outlets." Responses thus assessed support for anti-smoking policies based on stated agreement.

Despite the ease of gauging attitudes towards tobacco, alcohol, or cannabis, most measurement instruments in this area often depart from the conventions of the attitude field. Rather than using semantic differential or Likert scales, tobacco research often relies on trait -like scales that combine statements about feelings, beliefs, intentions, and/or behaviors, as attempts to assess a general disposition towards use of the substance. These scales tend to be highly specific and require a lengthy validation process, often leading to the publication of numerous instrument validation pieces. For example, Etter, Humair, Bergman, and Perneger (2000) conducted a large validation study (N= 643) smokers who answered open-ended questions about the positive and negative aspects of smoking. The most frequently-reported positive aspects were the pleasurable and relaxing effects of smoking. The most frequently-reported negative aspects were the health detriments and the unpleasant odor of smoking. Responses were factor analyzed leading to grouping the items into (a) adverse effects of smoking, (b) psychoactive benefits of smoking, and (c) pleasure of smoking. As expected, these subscales predicted differences in stages of change (from merely considering quitting to maintaining quitting for at least 6 months), number of smoked cigarettes per day, and intention to quit in a group of smokers. The scale also predicted relapses among participants who were ex-smokers at baseline. Notably, because both adverse and positive effects had positive associations with number of cigarettes a day, the difference between perceived positive and negative effects had no association with quitting. Yet, the internal consistency of the sub-scales was satisfactory.

Interestingly, many contemporary attitude scholars would consider the Etter et al. (2000) measure to assess beliefs instead of attitudes. Recall that such initial measurement attempts as Thurstone scales involved identifying items that, if endorsed, would imply a positive attitude towards an issue. In Thurstone's approach, a collection of items like "Smoking is enjoyable" and "There is no health benefit to

smoking" are presented to a group of participants who would be asked to judge whether each item represents a positive attitude towards smoking using a scale from 1 (e.g., *not at all*) to 9 (e.g., *extremely*). Each item with low rating variance is assigned a value based on the item's mean calculated over participants. Items with high variance are discarded because they do not reflect a clear evaluative meaning, and those selected form the attitude scale. A different group of respondents check with which scale items they agree, and the median of the checked items becomes the respondent's attitude score.

Thurstone's scales have been used rarely in the area of smoking but there is one important study that incorporated these measures. Jaccard and colleagues (1975) validated the construct of attitude towards cigarette smoking by administering a 15-item Thurstone scale, a Likert-like measure, a Guilford self-rating scale ("If I were to rate my attitude towards cigarette smoking, I would say it is:" unfavorable to favorable), and three semantic differential scales (1975). All of these scales were highly inter-correlated (rs $\geq$ .70) and discriminated from using the same measurement methods to assess other attitudes objects. However, the Thurstone approach requires writing belief items ahead of time in order to later select those that best represent the attitude towards smoking. Overall then, the method is less efficient than the semantic differential, Likert, and Guilford methods.

Importantly, expectancy-value models were the first to explicitly distinguish attitude as an evaluation of an object from its underlying beliefs and evaluations (Fishbein, 1963; Rosenberg, 1960). In this framework, the attitude towards the object is a function of the belief that an object has a set of attributes and the evaluation of each attribute. Thus, the belief that smoking makes you feel alert is multiplied by the perceived favorability of feeling alert, and a summary attitude is derived from each belief times evaluation pair (Ajzen & Fishbein, 1972). Consider a questionnaire developed by Fishbein, Ajzen, and Hanson (1999) based on 1 perceived outcomes of smoking. Outcome evaluations were measured on the following semantic differential scale.

bad	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	good
	extremely	quite	slightly	neither	slightly	quite	extremely	

Outcome beliefs were measured on the following scale.

Unlikely	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	likely
	extremely	quite	slightly	neither	slightly	quite	extremely	

The specific items appear in Table 1 and responses to them (in the format above) can be used to derive an expectancy-value measure of attitudes towards smoking. Specifically, both beliefs and evaluations are scored from -3 to +3, each evaluation (e_i) is multiplied by its corresponding belief (b_i), and the results are summed over the 12 outcomes considered to produce a summary score, $\sum_{i=1}^{12} b_i \times e_i$. This summation in turn provides an indirect attitude measure that can replace such a direct measure as the average of several sematic differential scales about smoking cigarettes. However, the real advantage of having these outcome measures is understanding the belief bases of the attitude and potentially targeting them in interventions to reduce smoking. For example, these items enable researchers to separate respondents who intend to quit smoking from those who do not and describe the beliefs and evaluations of the two groups. If researchers detect that intenders weigh physical-health outcomes heavily, a campaign can be designed to leverage this concern.

Table 1

Measures of Outcome Beliefs and Evaluations

Outcome Evaluation Measures (Unlikely – Likely)	**Outcome Belief Measures** (Unlikely – Likely)
1. If I do things that help me relax, that is:	1. If I smoke cigarettes, it will help me relax:
2. If I do things that make me feel good, that is:	2. If I smoke cigarettes, it will make me feel good:
3. If I get cancer, that is:	3. If I smoke cigarettes, I will get cancer:
4. If I get along with my friends, that is:	4. If I smoke cigarettes, it will make me smell bad:
5. If I get heart disease, that is:	5. If I smoke cigarettes, it will be bad for my health:
6. If I smell bad, that is:	6. If I smoke cigarettes, it will help me control my weight:
7. If I do things that increase my chances for health problems, that is:	7. If I smoke cigarettes, it will help me get along with my friends:
8. If I control my weight, that is:	8. If I smoke cigarettes, I will get heart disease:
9. If I have yellow teeth, that is:	9. If I smoke cigarettes, it will make my teeth yellow:
10. If it is harder for me to breathe, that is:	10. If I smoke cigarettes, it will be harder for me to breathe:
11. If I spend a lot of money, that is:	11. If I smoke cigarettes, it will cost me a lot of money:
12. If I do things that I enjoy, that is:	12. If I smoke cigarettes, it will be enjoyable:

Expectancy Measures

As is apparent from Table 1, knowing that a population believes that smoking controls body weight is often sufficient to conclude that the outcome is perceived as positive. For that reason, researchers often default to only measuring outcome expectancies. For example, Brandon and Baker's (1991) Short Smoking Consequences Questionnaire is as follows:

0 Completely Unlikely	1 Extremely	2 Very	3 Somewhat	4 A Little Unlikely	5 A Little Likely	6 Somewhat	7 Very	8 Extremely	9 Completely Likely

1. Cigarettes taste good.
2. Smoking controls my appetite.
3. Cigarettes help me deal with anxiety or worry.
4. I enjoy the taste sensations while smoking.
5. Smoking helps me deal with depression.
6. Cigarettes keep me from overeating.
7. Cigarettes help me deal with anger.
8. When I smoke the taste is pleasant.
9. I will enjoy the flavor of a cigarette.
10. I will enjoy feeling a cigarette on my tongue and lips.
11. By smoking I risk heart disease and lung cancer.
12. Cigarettes help me reduce or handle tension.
13. Smoking helps me control my weight.
14. When I'm upset with someone, a cigarette helps me cope.
15. The more I smoke, the more I risk my health.
16. Cigarettes keep me from eating more than I should.
17. Smoking keeps my weight down.
18. Smoking is hazardous to my health.
19. Smoking calms me down when I feel nervous.
20. When I'm angry a cigarette can calm me down.
21. Smoking is taking years off my life.

The scale has four internally consistent factors: (a) Negative Consequences Scale, (b) Positive Reinforcement Scale, (c) Negative Reinforcement Scale, and (d) Appetite/Weight Control Scale. In terms of concurrent validity, the total scale correlated with smoking quantity (cigarettes/day): (Adults: $r = .50$; Adolescents: $r = .32$), smoking frequency (days/month) (Adults: $r = .42$; Adolescents: $r = .32$), nicotine

dependence (Adults: $r = .52$; Adolescents: $r = .28$), and number of unsuccessful quitting attempts (Adolescents: $r = .23$). In addition, the scale predicts adult smoking frequency at a two-year follow-up ($r = .46$) (https://cancercontrol.cancer.gov/brp/tcrb/guide-measures/short_form_smkng_con_quest.html).

Similar scales are popular in the alcohol domain as well. For example, an alcohol-expectancy scale (see Table 2; Brown, Goldman, Inn, & Anderson, 1980; Goldman et al., 1997) has a different number of factors depending on the populations and has been used in community and health care settings (Brown, Goldman, Inn, & Anderson, 1980; Goldman et al., 1997; Stein et al., 2007). Expectancies include cognitive and mood outcomes such as feeling more creative and less angry or anxious, and social outcomes such as being friendlier.

Table 2

Alcohol Expectancies Scale

Item	**Agree**	**Disagree**
I feel more creative after I've been drinking.	yes	no
Drinking makes it easier to concentrate on the good feelings I have at the time.	yes	no
If I'm feeling restricted in any way, a few drinks make me feel better.	yes	no
Men are friendlier when they drink.	yes	no
Alcohol makes me need less attention from others than I usually do.	yes	no
After a few drinks, I feel more self-reliant than usual.	yes	no
When drinking, I do not consider myself totally accountable or responsible for my behavior.	yes	no
Alcohol enables me to have a better time at parties.	yes	no
Drinking makes the future seem brighter.	yes	no

I drink when I'm feeling mad.	yes	no
Drinking alone or with one other person makes me feel calm and serene.	yes	no
After a few drinks, I feel brave and more capable of fighting.	yes	no
Drinking can make me more satisfied with myself.	yes	no
My feelings of isolation and alienation decrease when I drink.	yes	no
Alcohol makes me worry less.	yes	no
Alcohol seems like magic.	yes	no
Drinking helps get me out of a depressed mood.	yes	no
After I've had a couple of drinks, I feel I'm more of a caring, sharing person.	yes	no
Alcohol decreases my feelings of guilt about not working.	yes	no
I feel more coordinated after I drink.	yes	no
Alcohol makes me more interesting.	yes	no
If I'm feeling afraid, alcohol decreases my fears.	yes	no
Alcohol makes me feel better physically.	yes	no
Alcohol makes it easier to forget bad feelings.	yes	no
I often feel sexier after I've had a couple of drinks.	yes	no
I'm a better lover after a few drinks.	yes	no
Women can have orgasms more easily if they've been drinking.	yes	no
I enjoy having sex more if I've had some alcohol.	yes	no
Some alcohol has a pleasant, cleansing, tingly taste.	yes	no

Sometimes when I drink alone or with one other person it is easy to feel cozy and romantic.	yes	no

In the domain of cannabis, the *Cannabis Effect Expectancy Questionnaire, Brief* in Table 3 performs similarly to their alcohol and smoking counterparts. Overall, this kind of scale can be used to design interventions, just like the belief scales in expectancy value measures. However, if the goal is simply to gauge attitudes towards smoking, semantic differentials are more practical, are briefer, and have better internal consistency than outcome-based measures. Likert scales may also be used, although they introduce acquiescence biases (see Krosnick et al., Volume 1).

1. Cannabis makes it harder to think and do things (harder to concentrate or understand; slows people down when they move).				
1	2	3	4	5
Strongly Disagree	Somewhat Disagree	Uncertain	Somewhat Agree	Strongly Agree
2. Cannabis helps a person relax and feel less tense (helps a person unwind and feel calm).				
1	2	3	4	5
Strongly Disagree	Somewhat Disagree	Uncertain	Somewhat Agree	Strongly Agree
3. Cannabis helps people get along better with others and it can help a person feel more sexual (talk more; feel more romantic).				
1	2	3	4	5
Strongly Disagree	Somewhat Disagree	Uncertain	Somewhat Agree	Strongly Agree
4. Cannabis makes people feel more creative and perceive things differently (music sounds different; things seem more interesting).				
1	2	3	4	5
Strongly Disagree	Somewhat Disagree	Uncertain	Somewhat Agree	Strongly Agree
5. Cannabis generally has bad effects on a person (people become angry or careless; after feeling high a person feels down).				
1	2	3	4	5
Strongly	Somewhat		Somewhat	Strongly

Disagree	Disagree	Uncertain	Agree	Agree
6. Cannabis has effects on a person's body and gives people cravings (get the munchies/hungry; have a dry mouth; hard to stop laughing).				
1	2	3	4	5
Strongly Disagree	Somewhat Disagree	Uncertain	Somewhat Agree	Strongly Agree

Note that expectancy measures are often labeled attitude scales, but in actuality constitute belief scales because they are analogous to outcome belief measures rather than being a direct tie to such measures as "smoking is enjoyable." For example, the *Scale for the Measurement of Attitudes towards Alcohol* by Francalanci et al. (2011); see Table 4) includes three factors, two of which comprise the outcomes of Social Ease and Unease. Ease describes the perception that alcohol can facilitate social relations, relationships with the opposite sex and interactions with peer groups. Unease describes such outcomes as escaping from feelings of despair, sadness, anger, or personal, family or relationship problems. In addition, there is a third factor that describes cost as a facilitator of drinking and includes items such as not turning down free drinks. The inclusion of a facilitator or antecedent is unusual, although McGuire and McGuire (1988) describe how the evaluative implications of antecedents can affect evaluations of an object.

Table 4

Scale for the Measurement of Attitudes towards Alcohol

Domain	Item
Domain 1: Social Ease Describes the perception that alcohol can ease social relations,	1.1 Drinking helps me feel at ease within my group 1.2 I drink to ease relations with the opposite sex

relationships with the opposite sex and belonging to peer groups.	1.3 I drink to be more talkative 1.4 I drink to feel more self-confident 1.5 Drinking alcohol helps me overcome my shyness
Domain 2: Unease Describes the need to escape from feelings of despair, sadness or anger or to deal with personal, family or relationship problems.	1. I drink alcohol when I need to relax 2. I drink alcohol to deal with feelings of despair 3 I sometimes drink when I am angry 4 I drink alcohol to escape from everyday problems 5 I drink when I'm sad
Domain 3: Economic Aspects Describes the ease/ inexpensiveness of obtaining alcohol.	3.1 When alcohol is free it's 'stupid not to take advantage' 3.2 I consume less when I have to pay for every drink 3.3 Never turn down a free drink 3.4 When I am offered a free drink I accept even if I don't feel like

	it 3.5 When I am offered several free drinks in one

Implicit Measures

Several measures of implicit attitudes are available, as covered elsewhere in this *Handbook* (e.g., Dovidio, Schellhaas, & Pearson, this volume; Gawronski & Brannon, Volume 1; Krosnick et al., Volume 1). The implicit association test (IAT; Greenwald, McGhee, & Schwartz, 1998) is perhaps the most widely used method to assess implicit attitudes and has been widely used in the context of the assessment of attitudes toward tobacco and tobacco products. For example, researchers assessed the effects of PSAs (Public Service Announcements) on implicit attitudes as measured by the IAT. The IAT measures associations between an object and good or bad by determining whether the associations of the target object with *good* are faster than corresponding associations with *bad*. In Czyzewska and Ginsburg's (2007) work, the valence categories of bad and good were represented by 20 words (10 with negative connotations and 10 with positive connotations). The targets were represented with 20 substance-relevant images (e.g., cannabis leaves, bongs or cigarettes, ashtray with cigarette butts) and 20 neutral images (i.e., common objects such as pencils, cups etc.). The IATs were scored following the conventional algorithm (Greenwald et al., 2003), after eliminating trials with reaction times below 300ms or above 3000ms and log transforming the results. The IAT index consists of a difference between the average reaction time obtained from the test block linking substance-related images with positive attributes and the test block linking substance-related images with negative attributes. Lower scores indicate a more negative attitude (i.e., faster reaction time to a negative word/substance image combination than to positive word/substance

image combination). However, the reliability of the measure is often low, which raises questions about its ability to predict important behaviors and outcomes (see Ajzen et al, Volume 1; Krosnick et al., volume 1).

The traditional IAT measures differential associations of two target concepts (e.g., positive/negative) with two target attributes (e.g., smoking/eating fruit) (Greenwald, McGee, & Schwartz, 1998). The test tracks latencies in response times when each attribute is paired with each target concept, and the difference in reaction times between the pairings is understood to represent which concept is more strongly associated with the smoking attribute. Findings using traditional (comparative) IATs generally indicate that both non-smokers and smokers reflect negative implicit attitudes toward smoking, but that smokers' attitudes are more favorable than non-smokers' (Huijding, de Jong, Wiers, & Verkoojen, 2005; Robinson, Meier, Zetocha, & McCaul, 2005; Perugini, 2005; Sherman et al., 2003). IATs have also revealed more favorable (i.e., less negative) implicit attitudes of individuals with close ties to smokers (Andrew et al, 2010; Sherman et al., 2009). Still, concerns about the comparative nature of the IAT as well as its reliability have led to the development of IAT variants.

Variants of the traditional IAT have been applied to assess attitudes toward cigarette smoking, including approach/avoidance, identification, single target, and personalized IATs. Approach/avoidance IATs aim to assess preferences for moving toward or away from a given stimulus, using labels pertaining to approach or avoidance, and identification IATs target self-relevance, employing labels regarding self vs. others (see Bradley, Field, Mogg, & DeHouwer, 2004; De Houwer, Custers, & DeClercq, 2006; Swanson, Rudman, & Greenwald, 2001). Approach/avoidance and identification IATs, as well as personalized IATs (incorporating labels related to liking/disliking), have demonstrated more favorable implicit attitudes of smokers than traditional IAT measures and have been more sensitive in detecting

distinctions among smokers and non-smokers (Bardin et al., 2014; De Houwer, Custers, & DeClercq, 2006; Bradley, Field, Mogg, & DeHouwer, 2004; Swanson, Rudman, & Greenwald, 2001).

Another key variant is the single target IAT (stIAT), the purpose of which is to assess evaluative associations with a single attribute or object, rather than comparing the implicit evaluations of two different objects (Karpinski & Steinman, 2006). In prior research, the stIAT has successfully distinguished between smokers' and non-smokers' affective associations with smoking, and has correlated with cigarette craving measures that did not associate with self-reported attitudes toward smoking (Huijding & deJong, 2006). The standard stIAT can assess implicit attitudes toward a product like tobacco with regard to perceptions of an attribute such as healthfulness. With this test, participants typically view three types of stimuli: words (or images) pertaining to the target product, positive words associated with the attribute (e.g., good health), and negative words associated with the attribute (e.g., poor health; see Pokhrel et al., 2016). In one block, words (or images) related to the target product are paired with words assigned to the good health label, and in the other block the target product is paired with words assigned to the poor health label. Single target IATs have shown increased ability to detect differences in attitudes among smokers and non-smokers, reflecting more neutral or favorable attitudes of smokers (Bardin et al., 2014; Huijding & de Jong, 2006). Relatedly, personalized versions of the IAT and the stIAT follow similar models to traditional IATs, but utilize personal labels of "I like" or "I dislike" (see Booth, Albery, & Frings, 2017). The function of the personalized component is to diminish the influence of a social desirability bias evident even in some implicit attitude measures, as research indicates that personalized labels may be more sensitive to individual differences in smoking preference and less reflective of societal norms (Bardin et al., 2014; De Houwer, Custers, & DeClercq, 2006). In fact, the personalized stIAT has also been able to more effectively distinguish affective associations of smokers and non-smokers, and has reflected more positive scores among smokers than have other IAT variants (Bardin et al., 2014).

When administering IAT variants such as the stIAT or personalized stIAT, for example, in one block, words synonymous with liking and words (or images) associated with the product are assigned to the "I like" label, whereas words synonymous with dislike are assigned to the "I dislike" label; another block incorporates the reverse pairing. Participants sort words and/or target pictures pertaining to the target attribute (e.g., a cigarette product) based on pairings with the relevant labels, using a left (e.g., 'E') or a right (e.g., 'I') response key on a keyboard. Each IAT consists of two critical phases ('hypothesis-consistent' and 'hypothesis-inconsistent'), mapping target attribute words/images onto the key representing the liking category in one phase and the disliking category in the other phase. Prior to each critical phase, participants complete a practice phase. The strength of the association between the attribute and the target concepts is assessed using the standardized mean difference score of the 'hypothesis-consistent' pairings and the 'hypothesis-inconsistent' pairings (e.g., D2SD and D600 penalty measures – d-scores; see Greenwald, Nosek, & Banaji, 2003; for scoring, see also Huijding & de Jong, 2006; De Houwer, Custers, & de Clercq, 2006). Approaches including the stIAT have been designed to address concerns with the comparative nature of the traditional IAT, which can potentially affect its reliability. Other implicit measures have also been developed to improve upon the reliability of the traditional IAT.

One measure that is relatively brief and reliable is the Affect Misattribution Measure (AMP; Payne, Cheng, Govorun, & Stewart, 2005). In this measure, participants view an image of alcohol or soft drinks for 125 ms (a prime), followed by a Chinese pictograph for 100 ms., and then a visual mask of a black and white pattern. Participants judge the degree to which the Chinese pictograph is pleasant, and this judgment is presumably affected by the presence of the prime. Thus, judging the pictograph as more pleasant after seeing alcohol than water photos is interpreted as an indication of a positive implicit attitude towards alcohol. The measure includes two practice trials and ten critical trials consisting of pictures of alcoholic beverages and five control pictures of drinking water, followed by 10 unique pictographs. The

internal consistency of the scale is high ($\alpha = .76$), and the scale predicts alcohol-drinking initiation at a later time, although the simple correlation with intention is very low ($r = .10$).

Implicit measures such as the IAT and the AMP present both challenges and contributions to the study of smoking attitudes and their link to behaviors. Traditional implicit measures are comparative in nature, making them difficult to use to draw firm conclusions about the absolute value of an implicit attitude. Research has specifically cautioned against absolute interpretations of IAT scores, such as the assumption that a zero score reflects neutrality, as various factors including separate attitudes about two target objects influence such scores (Blanton & Jaccard, 2006). Also, IAT scores may reflect not just individual attitudes but also cultural influences, particularly with regard to stigmatized behaviors like smoking (Karpinski & Hilton, 2001; Olson & Fazio, 2004). Still, adapted versions of the IAT including single target and personalized varieties offer mechanisms for addressing such concerns.

Measures such as the IAT and AMP offer distinct benefits beyond those provided by explicit measures. In some cases, individuals may be hesitant to share their attitudes about a sensitive subject or may even be unaware of such attitudes, and implicit tests provide a means of tapping into these unconscious perceptions (Greenwald & Banaji, 1995). Whereas traditional IAT measures may display external influences including social stigma, personalized variants help to reduce such influences in order to more closely measure individual attitudes. Approach-avoidance versions of the IAT, as well as the AMP, also offer opportunities to assess broader affective responses to smoking targets; the latter has specifically revealed more positive implicit attitudes toward smoking in particular situations, such as when smokers are experiencing withdrawal or when they view images of people with cigarettes rather than cigarette pack images (see Haight, Dickter, & Forestell, 2012; Payne, McClernon, & Dobbins, 2007). Importantly, implicit measures have been useful predictors of smoking-related behaviors, successfully associating with such outcomes as youth smoking initiation and smoking craving, beyond the predictive

utility of explicit measures (Sherman et al., 2009; Huijding & de Jong, 2006). IAT scores, and over-time changes in such scores (i.e., scores becoming more negative), have further predicted quit attempts and smoking cessation, in some cases over and above predictions based upon explicit measures (Kahler et al., 2007; Chassin et al., 2010; Lee et al., 2016). IAT measures have also successfully predicted other cigarette-related outcomes, such as tobacco control policy support and cigarette expenditures (see, respectively, Macy, Chassin, & Presson, 2013; Greene, 2014). Furthermore, although the reliability scores of IAT measures display a wide range, they are often stronger than other implicit measures such as priming tasks (Bosson, Swann, & Pennebaker, 2000; Cunningham, Preacher, & Banaji, 2001).

Broadly speaking, implicit measures can be used for several types of attitudinal analysis related to smoking and other substance abuse behaviors. For instance, they can be used to test whether exposure to advertising for tobacco products, or alternatively, to specific examples of anti-smoking messages, yields differences in implicit product attitudes. Moreover, research can also be applied to assess differences in attitudes based on smoking status. Finally, the IAT can be used to test for correlations between implicit and explicit attitudes, and to see which relate more closely to a behavior of interest. While links of implicit attitudes to desired outcomes require further empirical testing, they show promise for informing public health interventions. As a result, some researchers have concluded that a wider variety of implicit measures should be tested and utilized to bear out evidence of which measures are most reliable and applicable in different circumstances (Payne, McClernon, & Dobbins, 2007). Notably, from a public health standpoint, the association of implicit attitudes to outcomes such as cessation success is meaningful, and implicit measures could be particularly useful in assessing responses to intervention materials and other mediated messages.

Selecting Attitude Measures

Researchers facing decisions about which measure to use may find the criteria in Table 5 useful.

Any decision must consider psychometric properties such as internal consistency, the efficiency of designing a measure in terms of time, effort, and resources, potential biases such as acquiescence, predictive power defined as the ability to predict behavior or health outcomes, and usefulness in intervention design. As shown in the table, semantic differential scales are high on all criteria except providing a description of beliefs that can aid in intervention design. The AMP has the same strengths and weaknesses as semantic differential scales, except that its predictive power is low. Likert scales are more threatened by acquiescence than semantic differential and Thurstone scales, but Thurstone scales measure beliefs and are thus more informative from an intervention design standpoint.

CONSEQUENCES OF ATTITUDES FOR SUBSTANCE USE BEHAVIOR

As stated previously, misuse of alcohol, tobacco, or cannabis can have lifetime negative consequences for both physical and mental well-being. Attitudes towards tobacco, alcohol, and cannabis are important to the extent that they predict use, and therefore prevent misuse. According to the Theory of Planned Behavior (TPB; Ajzen, 1991), a widely used model in substance use research, intentions to act drive behaviors and the intention-behavior relation has been frequently estimated in the area substance use and alcohol use (Elek, Miller-Day, & Hecht, 2006). The intention to use a substance in turn stems from attitudes toward the action, subjective norms, and perceived behavioral control (Ajzen, 1991). Attitudes refer to a person's evaluation of the desirability of the behavior, which depends on the perceived benefits and consequences of the behavior. Subjective norms refer to perceived social support for the behavior, and, perceived behavioral control refers to the ease of the behavior and the perceived ability to execute it. Thus, despite several interrelated factors, attitudes toward substance use are clearly key to initiating use or persisting use despite desires to curb. Thus, despite several interrelated factors, attitudes towards substance use are clearly related to initiating or persisting use of substances.

Previous work has also shown that the attitude toward alcohol misuse is the strongest predictor of alcohol misuse in both male and female adolescents (Dempster, Newell, & Marley, 2005; Williams & Hine, 2002), and that a positive attitude toward alcohol use, rather than a negative one, explains drinking behavior in adolescents (Kuther & Higgins-D'Alessandro, 2003). Similar findings have also been reported in the cannabis use literature (Schuermeyer et al., 2015; Stacy, Bentler, & Flay, 1994). Attitudes toward behaviors stems from beliefs in and evaluations of the outcomes of the behavior. Park, Seo, and Lin (2016) found that youth who thought smoking cigarettes makes young people look cool or fit had stronger intentions to smoke cigarettes in the future than those who did not. Other studies have found that adolescents who perceive a relation between smoking and maturity are more likely to have more positive attitudes toward smoking and intentions to smoke (Leventhal et al., 1980). Van de Ven et al., (2007) found that adolescents with asthma had more negative attitudes toward smoking than non-asthmatic adolescents and that this difference in behavior was accompanied by less smoking in asthmatic adolescents 18 months later ($R^2 = .36$).

The subjective norm is the perception that important others support one's behavior. Phua (2013) surveyed cigarette smokers and found that family members' disapproval and the actions of friends were predictive of attitudes. In essence, smokers do not want the scorn of their family members and look to their peer groups for models of appropriate behavior. These findings have been replicated for both the alcohol use (Kuther & Higgins-D'Alessandro, 2003) and cannabis use (Kobus & Henry, 2010). Important, the subjective norm is generally more predictive than the actual level of consumption by others (Perkins, 2007), even though the actual levels of use among peers are also positively related to consumption of a substance (A. Liu et al., 2006).

As already mentioned, perceived behavioral control is the subjective estimate of whether one can control a behavior and is very important in the domain of substance use. In a study of cardiac

rehabilitation patients, 31% of the sample made no attempts to swap to smoking cessation treatment four weeks after hospital discharge (Bakker, Nijkamp, Sloot, Berndt, & Bolman, 2015). The main reasons were low self-efficacy (a construct very similar to perceived behavioral control defined as the belief that they could not stop even if they wanted to; (Bandura, 1977), low intention to quit, and high craving levels. An interesting area regarding control is also the legality of a substance. In Colorado, 10% of cannabis non-users reported intentions to use if legalization occurred (Palamar, Ompad, & Petkova, 2014). One interpretation of these findings is that legalization reflects a change in perceived behavioral control, but does not influence individual attitudes. Non-users do not think they can start using cannabis due to barriers in place or lack of access. Therefore, the prospect of legalization changes the intentions and behaviors of nonusers is potentially relevant to public health.

THE FORMATION OF ATTITUDES TOWARDS ALCOHOL, TOBACCO, AND CANNABIS

Researchers have extensively investigated how attitudes towards alcohol, tobacco and cannabis are formed and how they change, with adolescents being an important focus because initiation of substance use usually occurs in adolescence and young adulthood and then steadily drops over time, barring alcohol use (Wagner & Anthony, 2002). In the following sections, we discuss major findings about attitude formation in the domains of tobacco, alcohol, and cannabis, many of which have been investigated from the lenses of social cognitive theory, social learning theory, and learning theory.[1]

Social cognitive theory (Bandura, 1989, 2001) and social learning theory (Akers, Krohn, Lanza-Kaduce, & Radosevich, 1979; Bandura, 1977) are two of the most cited theories in research on substance use. Both models assert that people form attitudes and behavioral intentions based on their observations of others, often well before deliberative thought is in place. For example, a study of preschoolers found that

[1] Due to space restrictions, some theories are not discussed. For example, the social ecology model is not discussed because it overlaps significantly with social learning theory. Further, theories focused on behavior, rather than attitudes, are not covered either (e.g., problem-behavior theory).

more than two-thirds of children reported any attitude toward alcoholic substances (Noll, Zucker, & Greenberg, 1990). This finding thus suggests that children and young adolescents develop alcohol-related attitudes long before initial alcohol consumption or explicit thoughts about alcohol use (Lang & Stritzke, 1993).

One of the main sources of substance use observations is parental behavior. Adolescents with smoking parents are more likely to smoke cigarettes than are adolescents with nonsmoking parents (Bauman, Carver, & Gleiter, 2001). However, children of parents who quit or are attempting to quit smoking are less likely to initiate smoking than children of parents who are active smokers (Farkas, Gilpin, White, & Pierce, 2000). Similarly, parents' alcohol-related attitudes can have direct influences on adolescent alcohol consumption: Small positive associations were found between parents' attitudes toward alcohol use and adolescent alcohol use concurrently (*r*s = .09 to .13; Thompson, & Wilsnack, 1987), and one year later (B = .261; (Ary, Tildesley, Hops, & Andrews, 1993). Presumably, parental attitudes predict parental alcohol use, which children observe as a respectable behavior and may follow or oppose depending on how docile or rebellious they are. Answers to similar questions in the area of cannabis are now beginning to accumulate. In a sample of parents from Washington post-legalization, Kosterman et al. (2016) found that 81% of parents still disapproved of children using cannabis before graduating from high school. Further, the attitudes of parents who do not use cannabis predict the attitudes and use among their adolescent children (Bailey et al., 2016), and parental use of cannabis predicts child use as well (Skenderian, Siegel, Crano, Alvaro, & Lac, 2008). Social learning clearly occurs in the domains of tobacco, alcohol, and cannabis use, and surrounds parental figures as models for their children's behavior.

Peers are another influential social group: Peer influence during adolescence has been well documented in the contexts of involvement with deviant peers and perceptions of approval as predictors of smoking (Chapman & Werner-Wilson, 2008; Maxwell, 2002). Correlations between adolescent and peer

behavior have been found to be both robust and sizeable in magnitude (*r*s=.43 to .60) when predicting future substance use (Allen, Donohue, Griffin, Ryan, & Turner, 2003). These findings can be interpreted in one of two ways. First, peer behavior may be a form of modeling for what is socially appropriate. Second, feelings of peer pressure may influence behavior. Further, once a behavior is enacted, cognitive dissonance may lead to a shift of attitudes to accommodate the new behavior (Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008; McMaster & Lee, 1991). Regardless of the specific processes at stake, the findings of peer influence have been verified for cannabis, alcohol, and tobacco use in large longitudinal studies. For example, D'Amico and McCarthy (2006) surveyed middle schoolers in the fall and spring semesters of the school year. Those who perceived positive peer attitudes and behavior regarding substances in the fall were more likely to be consuming a substance in the spring. Also, those who used one substance in the fall semester were more likely to be using another substance in addition to the original during the spring semester. These findings were corroborated in a meta-analysis of smoking initiation; having peers who smoke almost doubled the odds an adolescent initiated smoking, a pattern that was heightened when the peers were interpersonally close (J. Liu, Zhao, Chen, Falk, & Albarracín, 2017).

One of the primary means of combating peer pressure is by increasing self-efficacy, the other tenet of social learning and social cognitive theories. Self-efficacy can be measured as the perception of *general* self-efficacy in resisting substance use and aggressive peer pressure (Bandura, Caprara, Barbaranelli, Gerbino, & Pastorelli, 2003; Caprara, Regalia, & Bandura, 2002; Newton, Havard, & Teesson, 2012) or *specific* self-efficacy to refuse alcohol use in different situations, i.e., drinking refusal self-efficacy (Young, Hasking, Oei, & Loveday, 2007). General self-efficacy has shown no relation with risk of alcohol use (Newton, Barrett, Swaffield, & Teesson, 2014), but alcohol-specific self-efficacy has been negatively linked to alcohol misuse in adolescents observed over time (Conner & Higgins, 2010; Connor, George,

Gullo, Kelly & Young, 2011; P. A. Hasking & Oei, 2002). This component will be covered in greater detail in the *Intervention* section.[2]

In closing, social learning theory and social cognitive theory offer good explanations of substance use in adults as well, particularly in relation to outcome expectancies, another important consideration in these models. Akers and colleagues (1989) found that outcome expectancies explained a larger percentage of variance in drinking among adults than among adolescents, suggesting that alcohol-related attitudes play a stronger role in adults than in adolescents. Adults drink for perceived benefits like relaxation or social disinhibition, whereas adolescents drink to achieve or keep social standing (Blume & Guttu, 2015). It is therefore important to understand how sensitive adults are to the rewards and specific positive outcomes of substance use. A recent study investigated this question by integrating reinforcement sensitivity theory with social cognitive theory to predict alcohol consumption in adults (P. Hasking, Boyes, & Mullan, 2015). Adults who were more sensitive to reward reported high positive attitudes toward alcohol use and lower drinking refusal efficacy in social situations, which resulted in more alcohol-related problems and greater misuse (Hasking, Boyes, & Mullan, 2015). Similar patterns have been found in cigarette smoking (Scholz, Nagy, Göhner, Luszczynska, & Kliegel, 2009) and cannabis smoking (Katz, Fromme, & D'Amico, 2000) among adults, for whom smoking is primarily driven by outcome expectancies and self-efficacy in those without substance-dependencies.

In addition to social learning, biological learning also plays a role in developing positive attitudes towards tobacco, alcohol, and cannabis. To begin, a simple pairing of a neutral stimulus with a subsequent positive stimulus is enough to produce positive attitudes via conditioning (Lazev, Thaddeus, & Brandon, 1999). A smoker who drinks coffee and smokes will associate the smell of coffee with smoking, thus

[2] Whereas constructs such as self-efficacy, subjective norms, and perceived behavioral control are not attitudes, they are major components of attitude theories and are thus discussed for completeness.

leading to cravings when exposed to any reminder of coffee. Operant conditioning may also play a role because the outcomes of smoking can be rewarding whereas the outcomes of quitting are aversive. For example, because smoking reduces anxiety, people tend to smoke more when under high work stress and thus form a more positive attitude toward smoking (Westman, Eden, & Shirom, 1985). The same thing happens when they are in places they associate with substance use (Krank, Wall, Stewart, Wiers, & Goldman, 2005). These rewards only become stronger if substance use produces negative outcomes, which then induces greater substance misuse to cope with the associated negative emotions (e.g., alcohol abuse leading to drinking leading to joblessness and further alcohol abuse; Mallett, Rosenthal, & Keys, 2005).

MEDIA EFFECTS

A thriving communication scholarship has investigated the role of the media in the formation of attitudes towards alcohol, tobacco, and cannabis. One of the questions addressed explores the rates of substance-related advertising in legacy and emerging media. For example, one study sampled middle and high school students who completed 2-week Ecological Momentary Assessments (EMA) to measure exposure to alcohol and smoking (tobacco) media (Scharf et al., 2013). The study found that during the 2-week period, the adolescents had been exposed to an average of 255 instances of alcohol and tobacco related media, with alcohol and smoking respectively comprising 67% and 33% of the total media content (Scharf et al., 2013). Exposure to alcohol and smoking media was most likely to happen in the afternoons and on days leading up to the weekend, perhaps when parents are not around or are less vigilant (Scharf et al., 2013).

Although these exposures are frequent, the effects of alcohol and tobacco content is not always easy to estimate. A longitudinal study of adolescents found that exposure to alcohol in movies (a covert form of advertisement) leads to higher alcohol consumption 8 and 16 months later (Gibbons et al., 2010).

These effects are stronger in white than black adolescents and are demonstrated in the favorability of the adolescents' prototypes of drinkers, how willing they were to consume alcohol, and their association with friends who consume alcohol (Gibbons et al., 2010). Wills et al. (2009) conducted a similar study of positive portrayal of alcohol use in movies marketed to children and teenagers. Using a national probability sample of adolescents 10- to 14- years old, the researchers found that exposure to alcohol in movies predicted changes in estimates of peer use and positive alcohol expectancies, which in turn influenced adolescent alcohol use.

Although there is significant evidence indicating that exposure to alcohol in the media can lead to increased levels of drinking, other research has shown different results. A random-digit dial telephone survey was conducted to understand how exposure to alcohol use in the media affected alcohol use in adolescents in the United States (Dal Cin et al., 2009). The researchers found that the effect that alcohol in the media had on adolescents varied widely depending on other factors. Preconceived notions, willingness, and friends' use of alcohol were all correlated with personal use of alcohol and mitigated the effects of exposure to alcohol in the media (Dal Cin et al., 2009). Another study also found that exposure to alcohol in the media did not necessarily have the same effect on everyone, but still contributed to a pro-drinking culture (Kooderman, Anshultz, & Engels, 2012). In an analysis of 534 contemporary movies, 53% contained specific alcohol brands, and iconic characters like James Bond are portrayed as drinking as much (or more than) long-term alcoholics (G. Johnson, Guha, & Davies, 2013). The researchers also examined 27 cross-sectional and longitudinal studies about alcohol and the media, and found that adolescents who reported watching films containing binge drinking scenes were more likely to drink alcohol themselves (Kooderman, Anshultz, & Engels 2012). Further, viewers were more likely to drink immediately after watching a movie that contained binge drinking than viewers who watched control movies without binge drinking.

Movies and television shows are not the only sources of media that expose audiences to alcohol-related content. Since the advent of the Internet, social media has exponentially expanded, thus creating a new, largely unregulated market for alcohol advertisement and alcohol personal content (Moreno & Whitehill, 2014). As in the case of legacy media, there is a positive correlation between exposure to pro-alcohol content on social media and risky behavior (Moreno & Whitehill, 2014). An analysis of a random sample of 5,000 tweets found that 54% normalized alcohol use, 24% stated a preference for cannabis over alcohol, 2% expressed a preference for alcohol over cannabis, and only 7% discouraged the use of either substance (Krauss, Grucza, Bierut, & Cavazos-Rehg 2017). Tweets relating to alcohol also normalize drinking culture and encourage substance abuse by suggesting binge drinking is an accepted behavior (Krauss et al., 2017). A study of 485 middle school students asked them to log each alcohol advertisement viewed over a 2-week period (D'Amico et al., 2017). The study found that 3.6% of alcohol advertisements that the students reported seeing were viewed online, and that older, rebellious, or black students were more likely to see alcohol-related online ads online than were other students. Given that online alcohol advertisement exposure is linked to drinking behavior and that there has previously been demographic targeting regarding where ads appear, it is evident that programs should be put in place to address this issue (D'Amico et al., 2017).

The media can clearly have a large impact on adolescent's attitudes towards alcohol, but media messages also affect adults' drinking habits. Kim and Wells (2017) examined the portrayal of alcohol in reality-TV dating shows in an analysis of 45 episodes from 9 different reality TV dating programs coded for visual and verbal references to alcohol. Findings revealed that the majority of verbal references to alcohol were positive, and that 25% of the alcohol scenes also included sexual contents. The researchers discussed the possibility that reality TV may set expectations about the favorable effects of alcohol on the dating lives of the young adults who watch the programs (Kim & Wells 2017). Advertisements also play a

large role in the alcohol behavior of adults. Positive media messages may be more problematic for individuals with high levels of alcohol consumption. For example, in a study that examined the effects of alcohol commercials played before a movie for a sample of 184 young adults, viewers with high weekly alcohol consumption drank significantly more during the movie when they were first exposed to alcohol commercials than when they watched non-alcohol related commercials (Kooderman, Anschutz, & Engels 2011). However, among people who had low weekly alcohol consumption, there was little difference between those who saw an alcohol commercial and those who did not (Kooderman et al., 2011).

College students have received a great deal of research attention. Hoffman, Pinkleton, Austin, and Reyes-Velázquez (2014) examined the alcohol-related social media content to which university students are exposed in relation to their attitudes and beliefs about alcohol. The study included 637 college students from public and private universities who were surveyed about their social media habits, their alcohol related social media habits, and their alcohol use. Social media habits that lead to encountering alcohol marketing predicted alcohol led to engaging in risky behaviors whereas the use of general social media did not (Hoffman, Pinkleton, Austin, and Reyes-Velázquez 2014). The social media play an interesting role because the alcohol content does not need to come from advertisers in order to influence drinking habits. An analysis of tweets containing alcohol and drinking related messages between March 13 and April 11 2014 found that most of the tweets had pro-drinking themes and included references to frequent and/or heavy drinking and the desire or plan to drink in the near future (Cavazos-Rehg, Krauss, Sowles, and Bierut 2015). These tweets appear to introduce peer pressure and can potentially lead to risky drinking behavior when people attach value to being accepted within drinking cultures (Cavazos-Rehg, Krauss, Sowles, & Bierut 2015).

The tobacco industry spends billions of dollars per year on advertising (Kowlessar 2009) which is no surprise given that exposure to tobacco marketing during adolescence increases the likelihood that a

person will begin, or continue, smoking. Thus, tobacco companies use marketing strategies specifically aimed at youth (Yang 2002); however, tobacco advertising also impacts adults, and whether they will begin smoking and be able to quit in the future is in part dependent on the advertising to which they are exposed. Movies and TV shows can also influence individual attitudes towards smoking and the tobacco industry, for example, if popular characters use tobacco products during the show. In one large cross-sectional study of 4,524 adolescents in northern New England (Sargent, Gibson, & Heatherton 2009), exposure to tobacco smoking in movies and receptivity to tobacco marketing positively correlated with smoking (Sargent et al., 2009). Further, among smokers, 64% were receptive to tobacco marketing, which in turn was associated with higher levels of lifetime smoking than tobacco smoking in movies (Sargent, Gibson, & Heatherton 2009).

Regarding adolescent use of tobacco, more advertising is associated with more smoking among youth (Slater, 2005) and finding tobacco advertising in more places has also been associated with a greater propensity to use tobacco products (Arora et al., 2012). Indeed, one study demonstrated that exposure to any tobacco advertising, irrespective of the target population, led to lower perceived harm of smoking, stronger approval of smoking, stronger intentions to smoke in the future, and higher chance of having smoked in the past month (Wakefield et al., 2006). Although e-cigarettes are touted as healthier than traditional forms of smoking, media portrayal e-cigarettes usage is associated with increases in daily smokers' urge to smoke (Maloney & Cappella, 2016), suggesting they may perpetuate problems with quitting tobacco. Certain demographic subgroups of adolescents also appear especially susceptible to tobacco marketing, especially adolescent females (Yang, 2002).

Although tobacco promotion has been banned for nearly 50 years on television and for decades on billboards and other traditional media, these restrictions do not yet apply to digital media, a loophole that the tobacco industry is actively exploiting. For example, 12% of youth have reported engaging with

tobacco marketing online (Pierce et al., 2017) and cigar and cigarillo-producing companies utilize social media to promote their products with success (Kostygina, Huang, & Emery, 2017). Given the growing use of digital media among adolescents, this trend presents a large problem for public health that is only now beginning to be explored in greater detail.

Regarding adult use of tobacco, one empirical study utilizing a national dataset of adults in the United States found that exposure to tobacco marketing was associated with decreased likelihood of quitting smoking within the following six months. Tobacco marketing did not affect opinions on the safety of smoking, but it did affect individuals' perception of the benefits of smoking and the social acceptability of smoking (Kowlessar 2009).

In a separate study exploring how movies influence the public perception of tobacco, participants either watched *The Insider,* which contained information about unethical practices in the tobacco industry and information about the negative health effects of smoking, and or, *Erin Brockovich,* which contained no anti-tobacco message (Dixon, Hill, Borland, & Paxton 2001). Those who viewed *The Insider* held more negative views towards the tobacco industry and their business than did the control group, suggesting that exposure to anti-tobacco messages in films is an effective tool against Big Tobacco (Dixon, Hill, Borland, & Paxton 2001).

The media also appear to play a large role in members of society attitudes towards cannabis and its potential legalization. To better understand this process, a study by Stryker (2003) examined the levels of news coverage about cannabis and its impact on adolescents' cannabis behavior. Stryker expected to find that news coverage of the harm of cannabis would lead to disapproval of cannabis use, whereas positive coverage of cannabis would lead to a more positive attitude towards cannabis use and higher likelihood of personal use in adolescents. This hypothesis was partially supported, with media coverage partially explaining the variation in adolescent cannabis use over time (Stryker 2003). Yet, cannabis coverage in

mainstream media continues to be minimal because it is not legal in the majority of the United States. Yet, in California, where it is legal for medical purposes, there are television advertisements for medical cannabis. In a study of the effects of these ads on middle school children, researchers surveyed sixth- to eighth-grade students at 16 middle schools in Southern California (D'Amico, Miles, Tucker 2015). They found that exposure to medical cannabis advertising was associated with a higher probability of cannabis use one year later and suggests cannabis advertising needs to be regulated, just like alcohol and tobacco advertisement, and should stress that the ad solely promotes medical use.

The mainstream public media are big players when it comes to changing the public opinion about cannabis, but another emerging source of influence is social media. One study examined a random sample of 5,000 cannabis-related tweets by influential twitter users, and found the that positive tweets greatly outnumbered negative tweets 15:1 (Cavazos-Rehg et al., 2015). The most common tweets expressed intent to use cannabis, depicted chronic use, and described the health benefits of cannabis and why it should be legalized (Cavazos-Rehg et al., 2015). The people tweeting these cannabis-related messages were often young and disproportionately African-American, which suggests a need for online prevention efforts to counteract the prevalent positive cannabis content (Cavazos-Rehg et al., 2015). Social media clearly normalize cannabis use, particularly among adolescents. Even as the use of cigarettes is declining, the rates of cannabis use remain constant because many adolescents perceive cannabis as safer than cigarettes despite evidence of negative effects (Roditis, Delucchi, Chang, & Halpern-Felsher, 2016). Adolescents also believe that cannabis use is more socially acceptable than regular cigarettes (Roditis et al., 2016).

The social media explosion continues to offer vehicles for people to express ideas, and one study looked at the use of Instagram for cannabis related messages. Between November 29 and December 12 2014, researchers collected 417,561 Instagram posts with cannabis-related hashtags and then selected 5,000 posts at random to analyze (Cavacos-Rehg, Krauss, Sowles, & Bierut, 2016). Among these posts,

43% were explicitly related to cannabis with images of cannabis and cannabis concentrate (Cavacos-Rehg, Krauss, Sowles, & Bierut 2016). In another study, 568 Instagram posts showed a person ingesting cannabis or cannabis concentrates, and 9% of the posts were cannabis-related advertisements (Cavacos-Rehg, Krauss, Sowles, & Bierut 2016); such portrayals may normalize cannabis in society and change social norms related to smoking cannabis (Cavacos-Rehg et al., 2016). A similar study included an analysis of a random sample of 5,000 tweets mentioning cannabis during a one-month period (Krauss, Grucza, Bierut, & Cavasoz-Rehg, 2017). Over half of the tweets normalized cannabis, 24% expressed a preference of cannabis over alcohol, and only 7% of the tweets were anti-cannabis (Krauss et al., 2017). There were tweets mentioning using cannabis with friends, in the context of sex and romance, the belief that cannabis is safer than alcohol, and the preference of cannabis over alcohol, thus normalizing cannabis/substance abuse and encouraging cannabis use (Krauss et al., 2017).

The normalization of cannabis among groups of young adults leads to increased cannabis usage. A study conducted on college freshman found that perceptions of cannabis use among friends was most closely associated with personal cannabis use, and students who had the impression that cannabis use was frequent among other students also perceived that other students had positive attitudes towards cannabis (Neighbors, Geisner, & Lee 2008). Thus, normalization of cannabis use via social media can lead to increased cannabis use because recipients view their peers as having generally positive attitudes towards cannabis use, also leading them to endorse these attitudes.

SUBSTANCE USE INTERVENTIONS

When adolescents view using substances favorably and that using them will bring positive outcomes, they are more prone to consumption and more susceptible to the development of misuse problems at a later stage. Thus, changing adolescents' alcohol-related attitudes and expectancies is always a major goal of prevention/control programs (Bingham et al., 2011; Dempster et al., 2005; Newton,

Teesson, Vogl, & Andrews, 2010; Newton, Vogl, Teesson, & Andrews, 2009; Newton et al., 2012). Interventions aimed at changing attitudes can involve exposing participants to **fear appeals**, particularly **graphic imagery** about the physical effects of smoking in warning labels. The main goal of such images is to make recipients reconsider their attitude toward the behavior by revealing additional consequences or making negative outcomes more vivid and memorable. Ironically, such interventions may not only be ineffective, but may also sometimes increase cigarette consumption (Hansen, Winzeler, & Topolinski, 2010). Longitudinal tracking of smoking behavior after being exposed to the previously mentioned images found that some smokers smoke more cigarettes to counteract the negative influence of the packaging and thus boost their self-esteem. Similarly, the presentation of one-sided negative feedback and fear-inducing messages concerning alcohol can be ineffective when alcohol users activate self-defenses against the conflict produced by the messages (Giovazolias & Themeli, 2014). Yet, these counterintuitive findings occur only in active smokers; otherwise, fear appeals are effective in preventing substance use initiation. This claim is demonstrated in an extensive meta-analysis of fear appeals, which found a positive fixed-effect across a variety of health domains, including smoking, drinking, and substance use ($\bar{d}$= 0.27; Tannenbaum et al., 2015). A large online study looking at graphic warning labels also found engagement with smoking cessation messaging increased for more vivid warning labels (Ophir et al., 2017). These findings ultimately suggest there may be a sub-population for whom fear appeals are ineffective, but overall, these interventions successful prevent smoking and help in smoking cessation.

One of the main areas in the study of communications and substance-use prevention has been **message framing**, particularly whether **positive or negative** frames are more impactful (see Johnson, Wolf, Maio, & Smith-McLallen, Volume 1). Positive frames focus on the advantages of changing behavior, whereas negative frames focus on the disadvantages of not doing so. People often fail to perceive smoking as being as harmful as it is, especially those with low nicotine dependence or low

frequency of use (Moorman, & van den Putte, 2008). Not perceiving their smoking as harmful makes these smokers unlikely to pay attention to or incorporate negative information about smoking, in which case a benefits frame can be more successful (Maheswaran & Meyers-Levy, 1990). In a quasi-experimental study, smokers exposed to a positive (benefits of smoking cessation), a neutral, or a negative (deleterious effects of smoking) frame differed in changes in attitudes toward smoking (Shen, 2010). As predicted, recipients who did not perceive their behavior as harmful were less likely to think about the consequences presented in the negative framing, but those who already had a neutral or negative stance about smoking developed more favorable attitudes about and intentions to stop smoking. A study of college-student alcohol use also found that regular drinkers were responsive to positive frames but not to negative frames (Gerend & Cullen, 2008). Further, emphasizing short-term consequences was more effective in changing attitudes than emphasizing long term ones, probably because younger populations are more concerned with the present than the future (Gerend & Cullen, 2008). In this context, two-sided arguments may be beneficial when audience segmentation and tailoring are not possible (Rimal & Real, 2003). Finally, framing consequences or benefits in terms of social groups is also potentially viable. Kelly and Hornick (2016) found that individuals were more willing to integrate health messages when the message was framed as benefiting others or society compared to personal benefit.

Another aspect related to framing concerns recommending **abstinence or moderation** in the use of a substance. In research Albarracín, Cohen, and Kumkale (2003) conducted, participants received a message that recommended either abstinence from, or moderation in, the use of a new type of alcohol product. After reading these materials, participants either tried the product or performed a filler task before indicating their intentions to drink in the future. Results indicated that participants who did not try the product reported similar intentions to drink when they received the moderation message and when they received the abstinence message ($d = 0.03$). In contrast, among participants tried the product after

receiving the message, those who received the abstinence message had significantly stronger intentions to drink than those who received the moderation message ($d = 0.76$). One interpretation of these findings is that participants inferred their intentions after considering their trial behavior vis-à-vis an external influence (the message recommendation). Apparently, trying the product after a strong recommendation led participants to conclude that they liked the forbidden product. Another potential conclusion is that the discrepancy made people anxious and thus more likely to resolve these feelings by justifying their drinking behavior (Harmon-Jones et al., Volume 1). Although this particular interpretation seemed less plausible than the self-perception account based on additional data that Albarracín et al reported, both processes are relevant to situations in which the recipients' behavior contradicts an earlier persuasive message.

Intervention research has also made important contributions to the use of **normative influence**, particularly from parents, in the prevention of substance use. In the large randomized controlled trial *Prevention of Alcohol use in Students* (PAS program; Koning, van den Eijnden, Engels, Verdurmen, & Vollebergh, 2011), a parent intervention included the promotion of restrictive attitudes toward alcohol and a set of parenting rules about alcohol use. Compared to the individualized training of healthy attitudes toward alcohol use, Koning and colleagues (2011) found that only a combined intervention (i.e., with student and parent interventions) was successful at changing alcohol-related attitudes and perceived control among the adolescents. More importantly, after completing the intervention, the parent, rather than the adolescent attitudes, predicted the onset of weekly alcohol consumption among the adolescents a year later. This finding is troubling when considering the cannabis literature. Although parents have strong attitudes towards use by their children before they graduate from high school, 26% of the parents in a study in Washington state met DSM-IV criteria for cannabis dependence (Mason et al., 2015).

Considering that parental use predicts offspring use, similar interventions regarding cannabis may be more difficult as the population's sentiments about cannabis become more positive.

Normative interventions have also attempted to change the norms of what is acceptable behavior among peers. For example, prevention programs may change subjective norms by providing the actual number of adolescents who oppose alcohol use because this population tends to overestimate the extent of consumption among peers (Flom, Friedman, Kottiri, Neaigus, & Curtis, 2001; Perkins, 2007). In reality, however, this approach has had limited empirical support (e.g., Larimer, Turner, Mallett, & Geisner, 2004; Neighbors, Lee, Lewis, Fossos, & Larimer, 2007; Patrick, Lee, & Neighbors, 2014; Wechsler et al., 2003). For example, in a study conducted by Wechsler et al. (2003), adolescents in the intervention group received information about low rates of alcohol use among peers but their alcohol consumption did not differ from the control group. Similar conclusions resulted in Clapp, Lange, Russell, Shillington, and Voas's (2003) research, in which correcting false ideas about peer consumption did not translate into effects on actual use. A recent meta-analysis of 41 studies confirmed this conclusion: Even moderate-to-large changes in subjective norms yielded only small changes in drinking behavior (Prestwich et al., 2016).

The reasons underlying the failure of normative information to exert effects is currently not clear. As a possible explanation, however, Thombs et al. (2004) found that most of the adolescents receiving normative information experienced difficulties comprehending the aim of the intervention and were skeptical about the credibility of the normative messages. Similar methodological problems have been found in alcohol messaging, where student recipients often find messages either not helpful or not interesting enough to process (Kristan, & Suffoletto, 2015). Furthermore, adolescents in this type of research appear to believe that their peers have lied about their use and thus prefer to rely on their personal experiences regarding prevalent use as the "true" norm (Thombs et al., 2004).

The finding that normative arguments per se do not work was also appeared in a large meta-analysis of condom use interventions (Albarracín et al., 2005) and contrasts with strong effects that the communicator's identity produces (Albarracín & Glasman, 2016; Durantini, Albarracín, Mitchell, Earl, & Gillette, 2006). A similar contrast has been made in the area of substance use in adolescents. For example, BASICS (Brief Alcohol Screening and Intervention for College Students) intervention programs are a well-established substance use prevention literature that aim to make individuals aware of genuine risk associated with alcohol use in order to motivate change (Dimeff, 1999). In a modified BASICS intervention program, friends of the adolescent participants were invited to enroll in the intervention and to invite others as well (Neighbors et al., 2012). Peer participation was appealing and led to personal interactions with peers who were also interested in the prevention program. In this case, the live norm in the community program eliminated the need for program facilitators to describe the norm and reduced alcohol use

Perceptions of behavioral control also determine behavioral enactment. For this reason, policy changes and behavioral-training interventions have attempted to either reduce the ease of using a substance or to increase the perceived ability to refuse it. Using a quasi-experimental pre-post design, regular smokers conformed with a campus-wide smoking ban (Chaaya et al., 2013). However, change occurred in public behavior only: Recipients did not change their attitude toward smoking and felt that the ban was unjustified, and perceived the barrier to access as the primary reason for their change.

An alternative to introducing actual behavioral barriers is to increase the ability to act on intentions to not use a substance when it is offered. As substance use is inversely related to the perceived ability to resist influence (i.e., resistance self-efficacy), training in resistance skills (i.e., the ability to say 'no') has been tested in the area of adolescent alcohol use (Bingham et al., 2010, 2011). These programs provide two levels of learning: (a) to recognize high risk circumstances, where people tend to use under social

pressure, and (b) to acquire or reinforce effective rejection strategies, which people apply to turn down the substance offered by the other without rising tension. Conner and Higgins (2010) conducted a randomized control trial (RCT) comparing two experimental conditions: an implementation intention condition in which adolescents made a plan for refusing smoking under specific scenarios, and a self-efficacy condition aimed at improving the general confidence of participants in refusing cigarettes. Four years' post-baseline, the implementation intention condition had lower self-reported smoking behavior than the other group. These findings were directly replicated with alcohol, where practical training raised self-efficacy and reduced alcohol misuse were present at a four-year follow-up (Koning, van den Eijnden, Verdurmen, Engels, & Vollebergh, 2013). Notably, the condition labeled as *self-efficacy* had no effect, but the implementation intervention actually followed within classic behavioral skills training methods prescribed to increase self-efficacy (Bandura, 1977). A lack of planning or behavioral skills is generally problematic, and predicts inability to quit smoking as well (Tait et al., 2007).

There is an extensive literature using conditioning to change attitudes and behavior in the area of substance use. In an RCT, Houben, Havermans, and Wiers (2010) asked college students to pair pictures of beer with negative adjectives and images of water with positive stimuli. Compared to control participants who paired both beer and water with neutral words, experimental participants reported lower craving for beer, a decrease in explicit positive attitudes toward beer, and a lower volume drunk during a taste test. Extensive meta-analyses of substance use prevention interventions using conditioning also found a small significant effect for both adolescent alcohol prevention ($g^* = 0.13$, 95% CI [0.04, 0.22]; Tanner-Smith & Lipsey, 2015) and smoking prevention (S. G. Hofmann, Asnaani, Vonk, Sawyer, & Fang, 2012)

Conditioning has also effectively demonstrated implicit attitude change. A group of heavy drinkers was randomized to either pairing alcohol-stimuli with stop responses or with go responses. At follow-up,

the stop group reported less positive implicit attitudes toward beer consumption and also self-reported drinking less (Houben, Havermans, Nederkoorn, & Jansen, 2012). Another study using a similar methodology found that when implicit attitudes toward drinking changed, participants reported fewer alcohol-related problems in a subsequent 3-week period (Wiers, Van De Luitgaarden, Van Den Wildenberg, & Smulders, 2005). These findings are of further interest as explicit attitudes were related to outcome expectancies and implicit attitudes were related to misuse, suggesting different pathways of explicit and implicit influence. Similar results have been demonstrated in heavy users of cannabis at a six-month follow-up (Cousijn, Goudriaan, & Wiers, 2011), and replications have been attempted in smokers but results have been mixed or only present in some subgroups (e.g., those already thinking about quitting; Macy, Chassin, Presson, & Sherman, 2014).

Not surprisingly, the arsenal of successful techniques has led to combinations of these approaches in preventive programs (Prestwich et al., 2016; Tebb et al., 2016). Botvin (2000) reviewed preventive programs of substance use and concluded that correcting beliefs about peer usage levels is important for programs on resistance skills to succeed. He indicated that it is beneficial to include multiple change techniques such as jointly reducing positive substance-related attitudes, teaching resistance skills for better self-efficacy, and changing perceived peer norms. Other studies have confirmed that programs with multiple change techniques are successful in preventing alcohol use targeting adolescents (Griffin, Cleveland, Schlomer, Vandenbergh, & Feinberg, 2015; Lemstra et al., 2010; Tebb et al., 2016). For example, Griffin and colleagues (Griffin, Botvin, Nichols, & Doyle, 2003) examined the effectiveness of a preventive program on adolescents at high risk for substance use, including trainings targeting normative perceptions of alcohol use, development of perceived self-control, and acquisition of personal and social skills to resist social pressures regarding use. At a one-year follow-up, adolescents in the intervention

group reported a lower percentage of alcohol use than those in the waitlist group, providing empirical support for the efficacy of combinations of techniques.

To conclude, these areas have also held up when synthesized in systematic reviews. Smoking prevention programs for adolescents have small but significant effects on reducing smoking ($d = 0.16$; Tobler, Roona, & Ochshorn, 2000)). Similar results appear in the alcohol literature ($RR = 0.82$, $k = 29$; Faggiano et al., 2008), and systematic reviews focused more generally substance use have suggested cannabis prevention programs are effective (Teesson, Newton, & Barrett, 2012). Overall, these findings suggest that there are consistent results favoring the effectiveness of these interventions in preventing substance use and substance-related health outcomes.

CONCLUSIONS AND FUTURE DIRECTIONS

This chapter has reviewed the major areas regarding how substance use attitudes are measured, how these attitudes form and may relate to substance use behaviors, and how interventions can both prevent use and reduce current use by changing these attitudes. Broadly, the extant evidence suggests that both social modeling and media effects shape youth attitudes toward substances and that these influences need to be addressed in prevention of substance use. An interesting trend that needs to be addressed in the area of social learning relates to the need for interventions to account for parents having strong negative attitudes toward their children's use and also positive attitudes towards their own use. In these scenarios, quite understandably, adolescents may find information conflicting and rely on visible behavior rather than verbal statements to form their own attitudes and intentions. Remaining items on the media effects research agenda include the efficacy of anti-substance use campaigns, the selection of messages in the emerging social media, and required dosage and repetition of messages. Interactions among multiple, often contradictory messages also need to be addressed.

Despite a wealth of research regarding reducing substance misuse and preventing adolescent use, interventions still do not fully prevent substance use and effect sizes do show some heterogeneity. One consideration is the lack of tailoring observed in most interventions, which conflicts with knowledge that one format of messaging can influence only some recipients. Another consideration is whether changes are framed as permanent abstinence from the substance (i.e., nicotine gum only, no cigarettes), or whether low usage is recommended. Finally, there are related intervention components, such as mindfulness and stigma reduction, that have not been directly linked to the concepts of this chapter and have been shown to be effective for reducing substance abuse (Grant et al., 2017; Hayes et al., 2004). Nonetheless, systematic research on this problem in the area of substance use has been scarce.

With the advent of implicit attitude measures, questions also arise concerning usefulness and validity, both generally and in the domains of alcohol, tobacco, and cannabis. To begin, there is a lack of triangulation in research on explicit and implicit attitudes, with studies generally including only one of the two, which makes it difficult to determine pathways and relative contributions. Theoretically, implicit attitudes should predict impulsive behaviors such as sensation seeking and cravings better than explicit measures (W. Hofmann & Friese, 2008), but it cannot be ascertained without systematically measuring and reporting both types of attitudes. Other unconscious measures related to attitudes may also be effective. A study of neural activity in relation to smoking messages found correlations between behavioral intentions and specific areas of the brain (Falk, Berkman, Whalen, & Lieberman, 2011). Employing these methods in combination with others may allow for triangulation and therefore more accurate results.

Finally, the effects of changes regarding substance-use policy also need to be explored. Cannabis legalization is one aspect. Furthermore, the pathways of substance use have changed in recent years with the advent of the e-cigarette and the popularization of water pipe smoking (hookah). A meta-analysis of

longitudinal studies found that youth who experimented with e-cigarettes had greater intentions to engage in combustive cigarette smoking than those who had not experimented with e-cigarettes (*OR*= 3.62, 95% *CI* = 2.42 to 5.41; Soneji et al., 2017). Further, Jensen et al. (2010) found that regular hookah smoking predicted combustive cigarette use eight months later in a sample of adolescent males. In a study of college students, hookah users had more positive attitudes and stronger intention to try cigarettes if they had not reported using in the past two months (Heinz et al., 2013). In both cases, non-combustive nicotine intake behaviors predicted attitudes and intentions towards combustive cigarette smoking. These findings are particularly troubling because hookah is perceived as more socially acceptable and healthier than cigarette smoking, despite evidence to the contrary (Primack, Soneji, Stoolmiller, Fine, & Sargent, 2015). In a separate study, individuals who had tried hookah smoking were more likely to engage in poly-use of substances (Cohn, Ehlke, Cobb, & Soule, 2017). Similarly, e-cigarettes are perceived as less harmful than traditional cigarettes even though their actual safety and benefits to health are debatable (Stephens, 2017).

To conclude, there is a burgeoning literature connecting attitudes toward substance use with both actual use and misuse. Advances in measurement of implicit attitudes and attention to rapid changes in what substances are vogue and perceived as "safe" suggest future pathways for improving public health. More attention also needs to be given to how substance use attitudes spread over both traditional and emerging media platforms in order to fully inform policy-makers interested in preventing use of alcohol, tobacco, or cannabis.

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Table 5. Selecting Appropriate Attitude Measures

Scale	What Is Being Measured	Reliability	Efficiency of development	Potential bias	Predictive power	Usefulness in intervention design
Explicit Attitudes						
Semantic differentials	Attitude	High	High		High	Low
Likert scales	Attitude	High	High	Acquiescence	High	Low
Thurstone scales	Beliefs	Moderate because there are generally multiple factors	Low		High	High
Expectancy-value measures	Indirect Attitude	Moderate because there are generally multiple factors	Low		High	High
Expectancy measures	Outcome beliefs	Moderate because there are generally	Low		High	High

		multiple factors				
Implicit measures						
Implicit attitude test	Implicit attitude	Low	Low, programming involved, images need to be selected for specific groups and contexts		Low	Low
Affect Misattribution Test	Implicit attitude	High	Low, images need to be selected for specific groups and contexts		Low	Low