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## Evaluation of a Web-based Intervention for College Marijuana Use

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*Syracuse University*

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## Abstract

Young adults in college have high rates of marijuana use, abuse, and dependence. Web-based interventions have been growing in popularity, but their dissemination currently exceeds empirical support. One especially popular (but understudied) program is The Marijuana eCHECKUP TO GO (e-TOKE) for Universities & Colleges (San Diego State University Research Foundation, 2009). The aim of the present study was to evaluate whether this program is effective in changing marijuana involvement and perceived norms in undergraduates. Participants were 317 undergraduates (52% female, 78% White) who reported marijuana use within the month preceding baseline. Conditions were the e-TOKE program or assessment only, crossed with brief vs. extensive baseline assessment (to assess assessment reactivity), producing four experimental conditions to which participants were randomly assigned. Thus, 161 (51%) received eTOKE (77 with extended baseline, 84 with brief baseline), and 156 (49%) received assessment-only control (85 with extended baseline, 71 with brief baseline). One month later, all participants reported on marijuana use, problems, abuse and dependence symptoms, and descriptive norms. Assessment reactivity analyses yielded no significant differences by assessment condition. Individuals completing the e-TOKE program reported less extreme descriptive norms ( $ps < 0.01$ ) but no decrease in marijuana use frequency, problems, abuse, or dependence symptoms ( $ps > 0.10$ ). Analyses controlling for baseline yielded similar results. The program thus seems effective for changing perceptions of others' use, but there is not yet evidence for its utility in changing personal use and problem indicators. More research with longer follow-ups is indicated, especially given the possibility that descriptive norms could play a mediating role in change.

EVALUATION OF A WEB-BASED INTERVENTION FOR COLLEGE MARIJUANA USE

by

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Dissertation

Submitted in partial fulfillment of the requirements for the degree of  
Doctor of Philosophy in Clinical Psychology

Syracuse University  
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## List of Illustrative Materials

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## Evaluation of a Web-based Intervention for College Marijuana Use

Marijuana use and abuse are common in the college environment, and are associated with other difficulties in areas such as mental health, other substance use, and academic performance. College students are likely to overestimate others' marijuana use, and to have personal use rates that correlate with their misperceptions. Several in-person marijuana interventions incorporate a norms correction component, usually with successful results. *Web-based* marijuana interventions addressing norms have also been created, but remain relatively unstudied. A web-based intervention for college marijuana use entitled The Marijuana eCHECKUP TO GO (or “e-TOKE”) for Universities & Colleges (San Diego State University Research Foundation, 2009) has been adopted by colleges across the country, but without empirical evaluation to indicate its effectiveness. The purpose of the current study is to conduct a randomized controlled trial to determine the short-term efficacy of e-TOKE when compared with an assessment-only control. Moderators (family history, stage of change, use level, semester) and mediators (perceived norms, pros and cons) of effectiveness are also proposed and tested, as appropriate.

### *College Marijuana Use and Related Problems*

Marijuana is a commonly used drug among young adults. Among adults 18-25, 16.5% report past month use, representing a peak in use in comparison with the closest younger and older cohorts (6.7% in adolescents aged 12-17; 4.2% in adults age 26 and older) (Substance Abuse and Mental Health Services Administration [SAMHSA], 2009). Consistent with this pattern, rates tend to increase with graduation from high school (White, LaBouvie, & Papadaratsakis, 2005). Thus, experimentation with marijuana generally peaks during the period of life often referred to as emerging adulthood (Arnett, 2000). After that developmental period,



many individuals cease use, whereas those with chronic use patterns and/or marijuana use disorders continue their involvement.

Many young adults attend college, a setting of autonomy and limited parental supervision. Large scale surveys suggest that 13% to 15% of college students use marijuana during a given month, one in four students use in the course of a year, and 30% to 36% use at some point in their lifetime (American College Health Association [ACHA] 2009a; ACHA 2009b; Bell, Wechsler, & Johnston, 1997). Rates of marijuana involvement differ substantially by university, with certain universities reporting particularly high and concerning rates of use. At Syracuse University, for example, self-reports suggest that 65% of students have tried marijuana, with 39% reporting past month use (Carey, unpublished data).

Given high rates of use in college settings, high rates of marijuana use *disorders* are not unexpected. Approximately one in ten freshmen develop a marijuana use disorder, a statistic that increases to one in four when considering past-year users only (Caldeira, Arria, O'Grady, Vincent, & Wish, 2008). Marijuana abuse is more common in college students than marijuana dependence (Caldeira, et al., 2008), suggesting that college students are more likely to experience recurrent problems related to use than to exemplify the typical profile of addiction (American Psychological Association, 2000). Perhaps for this reason, many students may not view their use as dangerous or worthy of treatment. However, concentrations of THC in marijuana are climbing, which increase the potential for dependence (National Institutes of Health, 2008).

Marijuana use is not only concerning in itself; it is also correlated with other problems and risks to well-being. College students who are more involved in marijuana are more likely to report subjective cognitive deficits (Kouri, Pope, Yurgelun-Todd, & Gruber, 1995) as well as

academic problems (Buckner, Ecker, & Cohen, 2010). Marijuana use is associated with more mental health problems such as depression and anxiety in college samples (Buckner et al., 2010). Suicidality may also be a concern in this population, as marijuana use has been shown to be associated with suicidality—after controlling for depression and anxiety—in a sample of younger adolescents (Chabrol, Chauchard, & Girabet, 2008). Heavy marijuana users in college are more likely to become involved with other illegal drugs, including hallucinogens, cocaine, and sedatives (Kouri, et al., 1995). College marijuana users also engage in binge drinking and cigarette smoking at higher rates than nonusers (Mohler-Kuo, Lee, & Wechsler, 2003). Finally, over the long-term, marijuana use can cause medical problems, compromising the respiratory system and exacerbating heart disease (Hall & Degenhardt, 2009). The concurrent and long-term risks of marijuana use do not always receive a great deal of attention, however, and marijuana is often perceived as a “safe” drug (Johnston, O’Malley, Bachman, & Schulenberg, 2009).

Given the high rates of marijuana use and related problems in college students, it could be helpful to understand how students view marijuana use in normative terms. One particularly important aspect of college students’ perceptions is the accuracy of students’ estimates of peer marijuana use.

#### *Perceived Norms and Marijuana Use*

Research suggests that college students overestimate the prevalence of marijuana use in their peers. Kilmer, Walker, Lee, Palmer, Mallett, Fabiano, and colleagues (2006) found that, in a group of participants in which only one third used marijuana, 98% viewed use in the last year as the norm. The American College Health Association also found large discrepancies between actual use and perceived use (ACHA, 2009a). Though approximately 15% of students had used marijuana in the preceding month, students estimated that over 80% of their peers had used

during that timeframe. Though 63.9% had never used the drug, abstinence was estimated at 8.5%. These trends are found in samples obtained from single institutions (e.g., LaBrie, Grossbard, & Hummer, 2009; Pollard, Freeman, Ziegler, Hersman, & Goss, 2000; Rabon, 2010) and in national samples of college students (ACHA, 2009a; ACHA 2009b). Pollard and colleagues (2000) found this norm overestimation to be present at various levels of personal use, implying a “False Consensus Effect” with heavy users (e.g., perceiving oneself as similar to peers), and a “False Uniqueness Effect” with light- or non-users (e.g., believing oneself as alone in drug abstinence). Page and Scanlan (1999) suggest that estimates of females’ use are more discrepant than estimates of males’ use.

Higher-than-actual perceived norms are problematic to the degree that they affect college students’ self-perceptions and personal patterns of use. Unfortunately, many studies have found students’ perceptions of others’ marijuana use to be positively related to personal use levels (Conner & McMillan, 1999; Kilmer, et al., 2006; LaBrie, et al., 2009; Lewis & Clemens, 2008; Neighbors, Geisner, & Lee, 2008; Page & Scanlan 1999; White, McMorris, Catalano, Fleming, Haggerty, & Abbott, 2006; Wolfson, 2000). Though causation is difficult to prove, these findings are suggestive of the idea that college students may be trying to match an inaccurate and overestimated norm. To the degree to which lower norms may lead to lower personal use, norm-correcting interventions may be useful for preventing marijuana abuse.

The literature on norms for college marijuana use mirrors that of norms for college drinking in many respects. Gross overestimation of others’ drinking is a common finding in the college alcohol literature (e.g., ACHA, 2009a; ACHA 2009b). A meta-analysis in 2003 indicated that the vast majority (91%) of studies on college drinking have found that college students overestimate their peers’ use (Borsari & Carey, 2003). Interventions seeking to decrease perceived

norms have received support in decreasing drinking, with reduction of perceived norms often serving as a mediator in this process with both in-person (e.g., Borsari & Carey, 2000; Carey et al., 2010) and computer-administered (e.g., Neighbors, Larimer, & Lewis, 2004; Dumas, McKinley & Book, 2009) interventions. A recent meta-analysis suggested that alcohol interventions make small-to-medium changes in perceived norms for local ( $d = 0.35$ ) and nationwide ( $d = 0.31$ ) peers (Scott-Sheldon, DeMartini, Carey, & Carey, 2009). Logic suggests that a similar intervention strategy could be used for marijuana. In fact, several attempts to use this strategy have been tested in adults and adolescents, mostly with encouraging results.

#### *Norms Manipulation in Marijuana Interventions*

The idea of manipulating norms to reduce marijuana abuse has precedent in the adult marijuana treatment literature. The Marijuana Check-Up (MCU) is an empirically supported in-person marijuana intervention for adult users. One important component of this intervention is the feedback section, which compares individuals with the typical citizen, and with users in treatment (Doyle, Swan, Roffman, & Stephens, 2004). The MCU is tailored to individuals in earlier stages of change (as opposed to more traditional clinical treatment programs), and applies to individuals with less severe constellations of problems whom may not typically be targeted for intervention (Stephens, Roffman, Fearer, Williams, Picciano, & Burke, 2004). The MCU compared favorably when tested in adults against traditional educational and assessment-only control conditions (Stephens, Roffman, Fearer, Williams, & Burke, 2007).

The MCU has been adapted to younger populations, with some success. Martin, Copeland, and Swift (2005) conducted a study on this type of intervention, and found that nearly 80% of teenagers in the study decreased or ceased use after the check-up. Swan, Schwartz, Berg, Walker, Stephens, and Roffman (2008) report on two other trials using a similar check-up with

teenagers. One trial suggested efficacy among heavy users; the other did not find significant effects. Another norm-based intervention was adapted for an emergency department setting, and led to decreases in marijuana use in a group of young adults (Bernstein, Edwards, Dorfman, Heeren, Bliss, & Bernstein, 2009). So, in general, norm-based interventions appear to be an efficacious strategy for decreasing marijuana involvement, and may be a promising approach to adapt to young adults in college.

#### *Web-based Interventions to Reduce Substance Abuse*

A relatively recent development in mental health has been the creation of *web-based* interventions (Atkinson & Gold, 2002), also known as e-interventions. Web-based interventions are often colorful, interactive, and engaging. They can be widely disseminated efficiently through distribution of website addresses and access instructions. Web-based interventions can provide a standardized intervention available to anyone with internet access, and it can usually be quickly and easily updated for all users. Such interventions are designed to be administered without a mental health professional, so they have potential to be cost-effective, providing services to a large number of individuals with minimal clinicians' involvement. Many producers of web-based interventions have found ways to tailor information to the users, and to provide personalized feedback on health behaviors. Yet, programs can simultaneously allow for anonymity, so that individuals accessing the program feel that it is safe to report on their behaviors. Efficacy studies have found support for web-based interventions for a variety of health behaviors, ranging from cardiac rehabilitation to mental health issues (Bennett & Glasgow, 2009). Web-based interventions may be particularly popular with young adults in college, as one study showed that three-quarters of college students use the internet for health research (Escoffery, Miner, Adame, Butler, McCormick, & Mendell, 2005).

Web-based interventions have been adapted to the field of substance use (Copeland & Martin, 2004). Specifically, e-Interventions for college drinking have enjoyed a rapid increase in research attention (Elliott, Carey, & Bolles, 2008). Meta-analytic findings indicate that their efficacy is significantly better than no treatment (e.g., assessment-only control conditions), and equivalent to other active, alcohol-related interventions (Carey, Scott-Sheldon, Elliott, Bolles, & Carey, 2009).

The success of web-interventions for drinking has sparked the adaptation of such interventions to *marijuana* use. Research indicates that marijuana users might find such an intervention highly acceptable. A survey of treatment acceptability in Canada indicated that adults who had used marijuana within the last year would prefer a computerized program to address marijuana use over any other modality of treatment (including a self-help book, a telephone call, or a session with a counselor) (Cunningham, 2005).

However, the efficacy research on web-based interventions for marijuana users is still in early stages. One study examined the efficacy of a nine-session computerized intervention designed to address both depression and alcohol or depression and marijuana use (Kay-Lambkin, Baker, Lewin, & Carr, 2008). These researchers found that individuals receiving the computerized program (which played sessions led by a therapist using motivational interviewing and cognitive behavioral therapy strategies) reduced marijuana involvement more than those receiving a brief one-session motivational intervention, and also more than those receiving individual therapy with similar content. Yet, it is hard to know what aspect of this multi-focused intervention led to the change. A second study (Budney, Fearer, Walker, Stanger, Thostenson, Grabinski, et al., 2011) tested a therapist-administered intervention based on motivational enhancement therapy, cognitive-behavioral therapy, and abstinence-based contingency

management (MET/CBT/CM) against a newly-developed computerized intervention with parallel content. Though this study was not randomized and did not include a no-treatment control, results suggested similar treatment outcomes between the two modalities. A third study evaluated a German program entitled “Quit the Shit” in a randomized controlled trial (Tossmann, Jonas, Tensil, Lang, & Strüber, 2011). The program yielded decreases in use as compared with the wait-list control condition, as well as favorable results on other mental health indicators (e.g., anxiety, depression).

Also worthy of note is a free web-based program that is available through the website for the National Cannabis Prevention and Information Centre in Sydney, Australia (National Cannabis Prevention and Information Centre, 2010). The program is designed for adults who wish to reduce their marijuana use. The program consists of a series of videos of a man providing information and prompting respondents to fill in information about their use. Consistent with other e-Interventions, issues such as pros and cons are addressed, feedback is provided, and goals and coping strategies are encouraged. Participants are prompted to complete different modules at different points in time, such as waiting a week between the first and second module in order to keep a marijuana use log. Research is currently being conducted on this program, and individuals completing this program are encouraged to fill out a pre-assessment, post-assessment, and three-month follow-up survey. Outcome data have not yet been published. Clearly, research on such interventions is still in an early stage. Programs focused specifically toward college students are perhaps more widely used, but even less frequently studied.

### *Web-based Interventions to Reduce College Marijuana Use*

A few web-based interventions have been developed for college students, with minimal research support at this time. A brief description of available programs follows, with the (limited) research literature on this topic addressed afterward.

A well-known web-based intervention for college marijuana use, known as “e-TOKE,” is available through San Diego State University (San Diego State University Research Foundation, 2009). A subscription to e-TOKE is priced at \$975 per campus per year, for unlimited (and anonymous) access. Approximately 300 campuses subscribe to this program, often facilitating student access by posting the web address for the program on campus websites (Doug Van Sickle, September 15, 2010, personal communication). Participation in the program takes approximately 20 minutes. The program offers a personalized feedback display presented to each student, addressing use levels, consequences, norms corrections, and recommended steps for decreasing use. It also allows universities to personalize the intervention to their campus by incorporating local norms and campus resources.

A search for other web-interventions for college marijuana use revealed limited alternative options for commercially available programs. In addition to the e-TOKE program as a stand-alone intervention, a separate organization has incorporated e-TOKE into a larger marijuana intervention program called Marijuana 101, which targets campus drug offenders (Third Millennium Classrooms, 2007). Marijuana 101 provides additional sections on issues such as legality and marijuana’s effects on the brain. A third website (independent of e-TOKE) had offered an optional marijuana component to supplement a larger web-based alcohol intervention (“BASICS Feedback,” 2010); however, this supplemental component is no longer available. These interventions address marijuana use through “Check-up” style interventions,



which encourage individuals in early stages of change to carefully (re)consider their decision to use marijuana (Walker, Roffman, Picciano, & Stephens, 2007). E-TOKE thus appears to be the top candidate for an intervention addressing marijuana use with the general college population (i.e., not specifically mandated college students).

Despite the development of web-based marijuana interventions for college students, minimal *research* has been done on whether such programs work, with only one published research study (Lee, Neighbors, Kilmer, & Larimer, 2010). No other studies could be identified by the author, by the two professionals involved in the creation of e-TOKE (Doug Van Sickle, September 13, 2010, personal communication; Scott Walters, September 12, 2010, personal communication), or by the lead author on the one existing publication (Christine Lee, September 14, 2010, personal communication) at the onset of the current project. (A second database search, conducted in March 2012, yielded no additional citations.) Thus, the dissemination of e-interventions for marijuana use seems to have progressed further than is justified by the supporting efficacy research.

In the one existing publication on a web-based marijuana intervention for college students, Lee and colleagues (2010) recruited 341 incoming college freshmen who had used marijuana in the previous three months. Participants in the intervention condition completed a web-based intervention consisting of feedback about their marijuana use, a norm correction component, and advice for making changes. The comparison condition was an assessment-only control condition. No main effects were found for the intervention at the three-month ( $n = 324$ ) or six-month ( $n = 320$ ) follow-up surveys. However, the authors did find a marginally significant interaction of intervention exposure with stage of change and a significant interaction with

family history, suggesting that the intervention may be more effective for individuals with a family history of drug problems and/or more readiness to change.

No published research studies evaluate web-based marijuana interventions for students *currently living in the college environment*. Thus, it has not yet been determined if exaggerated perceived norms formed by interaction with college peers can be addressed effectively in a web-based intervention. The experience-based norms formed by the college environment are likely to be more salient than the speculation-based norms of pre-matriculated students. An intervention that corrects norms shaped by experience may thus be more meaningful to students, and may be more likely to influence subsequent use, as long as students find the presented norms to be believable.

#### *Purpose of the Current Study*

The primary purpose of the current study was to evaluate a web-based intervention for college marijuana use, to determine if it led to reductions in college marijuana use, problems, use disorder symptoms, and perceived norms. The e-TOKE program was evaluated in the current study due to its widespread use despite the lack of empirical evaluation.

Despite the lack of significant main effects in the Lee and colleagues (2010) study, there were some reasons to expect that an effect may be found in the present study. Unlike Lee's study, the current study took place during the academic year, when students have more personal experiences in college situations involving marijuana. These personal experiences presumably help students form more salient perceived norms, which if corrected in a meaningful way, could make material seem more relevant and interesting. Also, the intervention in the current study has been used by hundreds of campuses nationwide for years. Thus, the program itself has likely been more extensively developed and edited than the intervention created by Lee and colleagues

for their research study, and is updated and improved periodically by its developers (Doug Van Sickle, September 15, 2010, personal communication). Also, the inclusion criteria for Lee's study was any use within the previous *three* months, meaning that some very infrequent users may have been recruited, limiting the amount of improvement possible for some participants. The current study restricted the participants to past-*month* users, which created more potential for improvement. Furthermore, more short-term effects could presumably be captured by this study's one-month follow-up, as compared with Lee's 3-month and 6-month follow-up surveys.

The author proposed that the e-TOKE intervention would decrease marijuana involvement more than completing assessment alone. However, the possibility was considered that the completion of marijuana assessment measures could serve as a mild intervention in itself and lead to behavior change. Assessment reactivity has been found in some substance abuse intervention studies, with the suggestion that this effect may be stronger in student populations (see meta-analyses by Jenkins, McAlaney, & McCambridge, 2009; McCambridge & Kypri, 2011). It has been suggested that this phenomenon may be triggered by self-reflection, reactivity to participating in the research process, and/or regression to the mean (Jenkins et al., 2009; McCambridge & Kypri, 2011). Due to this concern, the present study included four conditions: two intervention conditions (one with full baseline assessment, one with abbreviated baseline assessment), and two control conditions (one with full baseline assessment, one with abbreviated baseline assessment). This allowed for analysis of assessment reactivity effects in addition to intervention effects.

Secondary hypotheses address four proposed moderators of outcome. These analyses looked at individual-level variables to determine differential efficacy in sub-populations of users. The first moderator examined is family history. Though e-TOKE does not specifically target

individuals with a family history, the author proposed that having a family member with a substance use disorder may influence how seriously students may take the intervention, and/or influence concerns about personal vulnerability. There is precedent for such an effect in a web-based marijuana intervention in the study done by Lee and colleagues (2010). These researchers found a significant interaction of study condition and family history of drug problems at their 6-month follow-up, suggesting that the intervention may be more effective for young adults with a family history of drug use. Thus, it was proposed that students with a family history of substance use would be more responsive to the e-TOKE intervention.

The second moderator tested is stage of change. Stage of change (or readiness to change) is a concept representing a client's openness to consideration of health behavior change, and/or commitment to that change. Researchers have found this concept to be relevant to a variety of health behaviors, and it has gained a great deal of attention in substance use cessation in particular (DiClemente, Schlundt, & Gemmell, 2004). Though it has also received some criticism (e.g., challenges of whether the orderly progression through these stages is the only way to change behavior; Davidson, 1992), it remains a widely used model in substance abuse research. The transtheoretical model suggests that individuals in precontemplation are likely to be engaging in processes such as "consciousness raising" (i.e., learning facts that suggest the value of behavior change), whereas individuals in contemplation and preparation stages may be engaging in self-reevaluation and self-liberation, which consist of realizing the personal utility of behavior change and committing to it (Prochaska, Redding, & Evers, 1997). The e-TOKE program has the potential to activate any of these processes of change (e.g., raising "consciousness" of high rates of personal use by providing perceived norms, facilitating self-reevaluation by leading one to consider their allocation of time and money). However, the later

stage processes are more likely to result in noticeable changes in marijuana use behaviors due to the proximity to the action stage of change. Thus, it was expected that students in the precontemplation stage would have less noticeable change in marijuana involvement than individuals in later stages. This effect also has precedent in the literature. Lee and colleagues (2010) found a marginally significant interaction of study condition and stage of change at their 3-month follow-up appointment, with the suggestion that individuals with more readiness to change may be more receptive to the intervention. This differential efficacy may explain why Lee and colleagues (who recruited incoming college students without requiring interest in changing use) found nonsignificant main effects, whereas other interventions such as the Marijuana Check-Up (that recruit individuals interested in change) more often find significant effects (e.g., Stephens et al., 2007). This suggests that individuals who had already been contemplating change in marijuana involvement may benefit more from a web-based intervention addressing their use, as compared to individuals with little-to-no readiness to change.

Third, marijuana use level at baseline was tested as a moderator. Logically, individuals with higher use have more room to decrease use; thus, it would seem logical that the intervention would demonstrate greater effectiveness among heavier users. Heavier users also receive normative feedback that emphasizes their high use compared to peers, which may provide more ignition for change. Greater effectiveness for heavy users does have precedent in the marijuana intervention literature, specifically in a test of the in-person Teen Marijuana Check-Up (Swan et al., 2008). However, it was also considered that heavy users would be more committed and devoted to their use and thus *less* likely to change. Thus baseline use was evaluated as a potential moderator without a directional hypothesis.

Fourth, semester of data collection was tested as a moderator, due to the possibility that spring versus fall may be associated with different levels of use. Incoming freshmen, for instance, may change their use over the course of their first year in college. Thus, semester was tested as a moderator to rule out any differences based on semester of data collection.

The third and final set of proposed analyses involved testing potential mediators of intervention-related change, using Baron and Kenny's (1986) guidelines for testing mediation. Baron and Kenny provide analytic guidelines for establishing mediation via regression analyses, in which the proposed mediator is evaluated for its ability to explain the association between the independent and dependent variables.

Mediation tests were planned for two sets of constructs that the investigator proposed would be affected by the intervention and were likely to explain subsequent behavior change: perceived norms and decisional balance (pros and cons). First, the investigator speculated that perceived norms would mediate the effect of intervention on marijuana involvement. Change in norms was considered a likely mediator given the prominence of corrective normative feedback in the e-TOKE intervention. Furthermore, this effect has been found in studies of computerized interventions for college drinking that incorporate norms-manipulation (Lewis & Neighbors, 2007; Neighbors et al., 2004; Neighbors, Lewis, Bergstrom, & Larimer, 2006; Walters, Vader, & Harris, 2007). Second, the investigator speculated that e-TOKE may activate pros and cons to enable the change process, as the intervention highlights cons for the respondent to consider. Pros and cons have been associated with stage of change in various health behaviors (Prochaska, Velicer, Rossi, Goldstein, Marcus, Rakowski, et al. 1994), including marijuana use (Elliott, Carey, & Scott-Sheldon, 2011). According to the transtheoretical model, increases in cons of a behavior and decreases in pros of a behavior are reliably associated with movement towards

change (Prochaska et al., 1994). Thus, the investigator had planned to assess pros and cons as potential mediators if there were significant intervention effects, to determine if changing attitudes about the costs and benefits of marijuana use accounts for intervention efficacy.

## Method

### *Design*

The present study is a randomized controlled study with four conditions. Half of the participants were assigned to receive the e-TOKE intervention; half were assigned to assessment-only control. Within each of these groups, approximately half of participants completed the full assessment battery at baseline, whereas the other half completed an abbreviated baseline assessment. This allowed for assessment of both intervention efficacy and assessment reactivity. One month after participating in the baseline assessment (and intervention, where applicable), all participants were sent a follow-up survey that assessed marijuana use, problems, marijuana use disorder symptoms, perceived norms, pros and cons, and satisfaction with the intervention (where applicable).

The brief assessment groups were included to account for potential assessment reactivity. Though this limited the data available at baseline, random assignment (stratified by gender) was conducted to ensure baseline equivalence between groups (Campbell, Stanley, & Gage, 1963). In the event of no assessment reactivity, the conditions could be collapsed (making a general e-TOKE and general control condition) to increase the sample sizes and therefore increase the power of the tests. If assessment reactivity did occur, all conditions could be examined to determine which components of the process were effective. Specifically, the intervention condition and assessment type could both be considered as independent variables.

### *Participants*

A total of 320 past-month marijuana users were recruited from psychology courses at Syracuse University. The minimum sample size of 300 was based on an anticipated effect size of  $d = 0.35$  (representing an effect of small to medium magnitude; Lipsey & Wilson, 2001), an alpha level of 0.05, a power of 0.80, and an expected follow-up rate of 87% (effect size calculator by Soper, 2010). However, due to the increased sensitivity of detecting a potentially smaller effect with a greater sample size, recruitment was not capped at 300. Effect sizes are calculated given the possibility that small effects in a limited sample may not be detected via significance tests.

Three participants were nontraditional students (two aged 27, one aged 42), and were excluded from the current study. This was done because traditional college students were of primary interest to the current study, and there were insufficient numbers of nontraditional students to consider these students in separate analyses. Thus, 317 participants remained, and ranged in age from 18 to 23. Of these 317 students, 161 (51%) were assigned to receive eTOKE (77 with extended baseline, 84 with brief baseline assessment), and 156 (49%) were assigned to control conditions (85 with extended baseline, 71 with brief baseline assessment). Students were approximately evenly split by gender (52% female), and most were White (78%). The average age was 19.34 ( $SD = 1.22$ ), and most students were in their first (42%) or second (26%) year of college. Most were full-time students (99%) who lived on campus (76%); some worked part-time (27%). The average GPA was 3.34 ( $SD = 1.89$ ).

### *Procedure*

*Sign-up and assignment to condition.* Participants were recruited from two sources: the psychology department participant pool, and solicitations in psychology courses not using the



participant pool. The psychology participant pool administered a pre-screening survey electronically to all individuals in the pool, on which students had the option of responding to the following question: “Have you used marijuana in the past 30 days? This includes any method of use, including but not limited to smoking a joint or blunt, using a pipe, ingesting in food, using a vaporizer, or smoking marijuana in a hookah.” Participants who reported “yes” to past-month use had the option of signing up for the current study by indicating their interest, again using the electronic web-based research system. (The participant pool offered many research options and thus abstainers were not limited in their ability to participate in research.) The second source of recruitment involved allowing students to complete the study for extra credit in psychology courses not utilizing the participant pool. The investigator advertised the study via flyers and email invitations to students, inviting interested participants to email her directly. Though abstainers were allowed to participate (to ensure equal opportunity for extra credit), only past-month users’ data are included in the current analyses.

As students signed up, the investigator conducted separate randomizations for males and females. For each gender, participants are assigned conditions using a random number generator (<http://www.random.org/>; with numbers 1 through 4 representing the four conditions, and all other numbers skipped). This stratified randomization process was used to ensure relatively equal numbers of individuals in each condition, as well as similar gender breakdowns in each condition. Similar gender breakdowns within conditions are desirable, as gender has been shown to be associated with marijuana use levels in past research (Elliott et al., 2011).

Interested participants were sent an email describing how to participate in the study. The email read: “Thank you for choosing to participate in Attitudes and Perceptions of Drug use in College! This email will explain how to begin your participation. Please click on this link to

begin (LINK INCLUDED HERE). Please begin by reading the informed consent and proceeding to the survey if you agree to the conditions of the study. Further instructions will be presented as you complete the survey.” In the same email, the intervention condition participants were given instructions for accessing e-TOKE, which they were asked to complete following the survey. They were given the prompt: “You have also been chosen to complete the brief computerized program. AFTER completing the survey above, please go to this link (LINK INCLUDED HERE), and complete the brief program. In order to get full credit, you must enter the correct token number when asked. Your token number is XX. You will be sent a second survey in one month. Completing both parts of the study will qualify you for credit. Thank you for your participation, and please contact me (Jenn Elliott) if there are any questions: jcelliot@syr.edu.”

Four different baseline surveys were created using an online survey system (Limesurvey), one for each of the conditions. Participants were given a link to their condition’s baseline assessment. By clicking on the link they were given, they were taken to the appropriate survey for their condition, which logged their data under their personal token number (as the token number was incorporated into the web address).

*Baseline.* Once on the survey page, participants read the informed consent (Appendix A) and clicked to the next screen to indicate consent. The conditions receiving full assessment received all measures except the questionnaire rating intervention satisfaction (i.e., Appendices B-J). The brief assessment conditions only completed demographic information (Appendix B) and the social desirability measure (Appendix J) at baseline. Following the baseline assessment, the two control conditions received credit for participating, were told they were done with this part of the study, and were reminded that they would be receiving a follow-up survey one month later. Participants in the intervention condition then went on to complete the intervention.

Completion of the intervention was monitored twice weekly by the investigator to ensure participation (token numbers of completed interventions were provided by the intervention company via emailed Excel databases). Email reminders were given for participants who did not complete the intervention promptly (i.e., reminders were sent after approximately one week, ten days, and two weeks, as necessary).

*Follow-up.* One month after baseline (or intervention completion, if later), all participants received an email inviting them to complete the online follow-up survey. All participants completed questionnaires on substance use, marijuana related problems, marijuana use disorder symptoms, perceived norms, and marijuana decisional balance, which served as the outcome measures. The intervention satisfaction questionnaire was also administered to individuals completing the intervention. As before, the website address included the participants' token numbers and logged their data under that number (which matched their token number for their baseline survey).

### *Measures*

*Demographic Information.* Participants reported their age, year in school, gender, and ethnicity, for descriptive purposes (see Appendix B). They were asked whether they live on campus, and whether they are majoring in psychology. GPA was also assessed, on a 0.0-4.0 scale. Participants were asked a series of questions regarding whether their family members have a history of an alcohol or drug use disorder, to collect data on this potential moderator. The family history questions were adapted from Capone and Wood (2008), altered to assess both alcohol and drug use disorders. These "density" questions allow for the possibility for later research by degree of relation (e.g., first versus second degree relatives), though these analyses

are not presented in the current study. This survey was completed by participants at baseline only.

*Substance use.* Participants completed slightly modified marijuana use items from the Revised Drug History Questionnaire (Appendix C; Sobell, Kwan, & Sobell, 1995). This questionnaire assessed typical method, age of first use, frequency of use, and recency of use. Research has shown lifetime use and past-year use responses to be perfectly reliable over an interval of three weeks, with significant correlations in responses to number of years used ( $r = 0.74, p < 0.001$ ) and frequency of past month use ( $r = 0.49, p < 0.05$ ) (Sobell, Kwan, & Sobell, 1995). In addition, participants reported on frequency of their involvement with several other drugs over the preceding month. They reported on their recent use of alcohol, cigarettes, and other illegal drugs by estimating the number of times they had used in the preceding month. The substance use survey was administered at both time points.

*Marijuana Problems.* Participants completed the Rutgers Marijuana Problems Inventory at both time points (RMPI; White, Labouvie, & Papdaratsakis, 2005), an adaptation of the Rutgers Alcohol Problems Inventory (White & Labouvie, 1989) (see Appendix D). Participants rated 18 possible problems resulting from marijuana use in terms of their frequency of occurrence: never, 1-2 times, 3-5 times, 6-10 times, or more than 10 times in the last month. In previous research, the RMPI has been shown to be internally consistent (alphas range from 0.85 to 0.91) (Simons, Correia, Carey, & Borsari, 1998; White et al., 2005), and to correlate highly with use ( $r = 0.45, p = 0.001$ ; Simons et al., 1998) and another newly-developed measure of marijuana problems ( $r = 0.58, p < 0.05$ ; Simons, Dvorak, Merrill, & Read, 2012), suggesting validity. In the present study, internal consistency was also good ( $\alpha = 0.80$  at baseline;  $\alpha = 0.88$  at follow-up).

*Marijuana Use Disorder Symptoms.* Participants provided information regarding whether they have experienced seven symptoms of marijuana dependence and four symptoms of marijuana abuse by indicating “yes” or “no” to a series of questions about each symptom (see Appendix E). This questionnaire was administered at both time points. These symptom lists were taken directly from the items administered by the National Epidemiologic Survey on Alcohol and Related Conditions, and address symptoms consistent with DSM-IV diagnostic criteria for substance abuse and dependence (National Institutes of Health, 2006). In the present study, abuse symptoms had low internal consistency (baseline:  $\alpha = 0.52$ , follow-up:  $\alpha = 0.45$ ), likely due to the small number of items and low levels of symptom endorsement. Dependence symptoms had better internal consistency (baseline:  $\alpha = 0.79$ , follow-up:  $\alpha = 0.73$ ).

*Stage of Change.* The Stage of Change Questionnaire (SOCQ) was adapted for cannabis use from the Smoking: Stage of Change Short Form (see Appendix F; DiClemente, Prochaska, Fairhurst, Velicer, Rossi, & Velasquez, 1991). The SOCQ assessed recent use (over the preceding six months), past quit attempts, and quit intentions (for the subsequent six months), which allowed the investigator to assign individuals to stages (precontemplation, contemplation, preparation, action, maintenance, nonuser) consistent with the transtheoretical model of change (Prochaska & DiClemente, 1982). The Smoking: Stage of Change Short Form has been adapted for marijuana use in previous research (Elliott et al., 2011); this research suggested that earlier stages of change are associated with more positive and fewer negative perceptions of marijuana, whereas later stages are associated with more negative and fewer positive perceptions. This replicates the pattern seen in other health behaviors (Prochaska et al., 1994), supporting the applicability of this construct to marijuana. Due to previous research suggesting that half of participants would be in the precontemplation stage (Elliott and colleagues found 54% of

lifetime users to be precontemplators), stage of change was dichotomized into precontemplators versus later stages for moderation analyses. The SOCQ was administered at both time points.

*Marijuana Decisional Balance scale* (MDB; Elliott et al., 2011). The MDB is a 24-item scale that assesses the perceived pros and cons of marijuana use in college students (see Appendix G). It was administered at both time points to evaluate changes in marijuana attitudes from pre- to post-intervention, and to be assessed as a potential mediator. On the MDB, respondents rated the items regarding whether the items were likely to influence the respondent's decision to use marijuana, using a five-point scale ranging from 1 (not important) to 5 (extremely important). In previous research, the two scales have been found to be internally consistent (8 pros,  $\alpha = 0.91$ ; 16 cons,  $\alpha = 0.93$ ), and to correlate in expected ways with stage of change, marijuana expectancies, and intentions to use, among other variables, supporting validity (Elliott et al., 2011). In the current study, pros were internally consistent at baseline ( $\alpha = 0.86$ ) and follow-up ( $\alpha = 0.88$ ), as were cons ( $\alpha = 0.91$  at baseline,  $\alpha = 0.92$  at follow-up). Pros and cons were to be considered as potential mediators of intervention effects because e-TOKE addresses issues that could be considered cons of marijuana use (e.g., money spent, time wasted), which could presumably lead to changes in pros and cons following the intervention.

*Descriptive Norms.* As the intervention includes a norms manipulation, which may account for some of its effectiveness, descriptive norms items were proposed as mediators. To correspond directly with norms addressed in the intervention, participants were asked to estimate (a) the percentage of college students who use marijuana more than they do, (b) the percentage of college students who use marijuana less than they do, as well as (c) the percentage of college students that do not use at all in a typical month (see Appendix H). To supplement these questions, they were also asked to estimate the (d) percentage of college students who have used

marijuana in the last month and (e) the percentage of college students who have ever used marijuana in their lifetime. This questionnaire was administered at both time points.

*Injunctive Norms.* Injunctive norms (i.e., perceptions of approval/disapproval for a given behavior) were assessed (see Appendix I) given their possible ties to descriptive norms (since descriptive norms convey information about what is approved of or expected within a peer group; Cialdini and Trost, 1998). Participants reported whether they believed their close friends would approve, disapprove, or not care about varying levels of marijuana use, using a scale developed by the investigator. Respondents rated their perceptions of their friends' reactions to (a) abstention, (b) experimentation, (c) occasional use, and (d) regular use.

*Social Desirability Scale (SDS; Crowne & Marlowe, 1964; Reynolds, 1982).* The short form of the SDS (see Appendix J) consists of 13 statements that the respondent must endorse as true or false ( $\alpha$  [KR-20] = 0.76; Reynolds, 1982). Each statement prompts participants to endorse either a low-frequency socially desirable response or a high-frequency socially undesirable response regarding their typical behavior. Consistent endorsement of low frequency responses indicated that participants portrayed themselves in a socially desirable way that was unlikely to be accurate. Higher scores on the SDS are associated with lower reports of alcohol and drug use (Welte & Russell, 1993); the SDS was thus included to assess social desirability of participants, to determine presentation biases in reporting drug use. In the current study, the SDS demonstrated moderate internal consistency ( $\alpha$  [KR-20] = 0.65).

*Satisfaction / Treatment Acceptability* (Appendix K). At the one-month follow-up participants were asked if they completed the e-TOKE program. Those who indicated "yes" reported how long the intervention took them to complete (in minutes), and rated how much attention they gave the program (1=minimal; 5 = a lot). They were prompted to rate how useful

several tools in the program were (e.g., feedback on norms, campus resources), using a scale from 0 (not at all useful) to 4 (very useful). Additional questions addressed satisfaction with length, ease of use, online format, and whether they would recommend it to a friend. Participants also provided open-ended feedback via the following prompts: “What did you like about the e-TOKE program?” and “what did you dislike about the e-TOKE program?” (These data provide opportunities for later qualitative data analyses and are not analyzed in the current study.)

### *Intervention*

*Marijuana eCHECKUP TO GO (e-TOKE) for Universities & Colleges* (San Diego State University Research Foundation, 2009). E-TOKE is a brief (approximately 20 minute) web-based intervention designed to help college students think about their personal marijuana use and consider options for decreasing use. The program includes several screens of assessment regarding marijuana use, pros and cons, perceived norms of use, other valued activities, involvement with alcohol and cigarettes, and money spent on all substances. Several screens of feedback compare perceived norms with actual norms, provide feedback on annual money spent on substances (with comparisons with other possible uses of these funds), provide suggestions for campus resources that may fit their needs, and provide possible first steps to decreasing use. The program allows completers to move through the program at any pace, and the program can be completed at any computer with internet access.

### *Analysis Plan*

*Preliminary Analyses.* First, the scales were scored and evaluated regarding important psychometric indicators (e.g., internal consistency). Next, the overall sample was described on dimensions of substance use and average questionnaire scores. Then, normality of data was assessed to ensure that tests’ assumptions are met and thus analyses could appropriately be



conducted. Normality analyses included examining distributions visually, and considering skewness values. The investigator then determined if Winsorizing would be useful (if only a few outliers are present, and the distribution is otherwise normal), or if nonlinear transformations were more appropriate (if the data is clearly skewed).

Analyses were then conducted to determine if differential attrition occurred. Two types of attrition were evaluated: (a) intervention participants not completing the intervention, and (b) participants not completing the follow-up. First, the numbers (and percentages) of participants in the intervention condition who (a) completed versus (b) did not complete the e-TOKE intervention were reported, and the groups were compared. Second, the numbers (and percentages) of participants in all conditions who (a) completed the follow-up versus (b) did not complete the follow-up were reported, and the groups were compared. All attrition analyses compared the groups on demographic and baseline substance use variables, using t-tests for continuous data (e.g., marijuana use frequency) and chi-square or Fisher's exact tests for categorical data (e.g., gender).

Baseline equivalency of conditions (i.e., effectiveness of randomization) was assessed for the two groups that completed full baseline measures. Equivalence with the brief assessment groups was tested on demographics and social desirability; equivalence on baseline substance involvement must be assumed.

*Assessment Reactivity.* To assess the potential for assessment reactivity, 2 (intervention condition) by 2 (assessment condition) factorial ANOVAs were conducted on all continuous dependent variables, to determine whether there was a main effect of assessment condition, or an assessment condition by intervention condition interaction. As an additional measure, the two control conditions (and later, the two intervention conditions) were evaluated for equivalence at

follow-up. All dependent variables (frequency of use, marijuana problems, marijuana use disorder symptoms, pros and cons, perceived norms) were compared using independent two-sample t-tests. If none of these analyses were significant, it was assumed that the extended baseline assessment did not have an effect on the target behaviors (i.e., there was no assessment reactivity), and the groups were combined for later analyses to increase power. However, it was considered possible that the full assessment control group participants would decrease their marijuana involvement more than the brief assessment control group (as a result of completing the extensive set of marijuana-related questionnaires). If the two control groups (or the two intervention groups) were found to be significantly different, they were to be treated as separate conditions.

*Primary Analyses: Intervention Effectiveness.* The intervention effectiveness (intent-to-treat) analyses were conducted in steps. As the assessment conditions were equivalent at post-test, they were combined into an overall intervention group and overall control group. A set of ANOVAs were run for continuous dependent variables to determine the effects of intervention and gender on post-test values of marijuana use frequency, problems, abuse symptoms, dependence symptoms, perceived norms, pros, and cons. (Gender was analyzed because it has been shown to be related to level of marijuana use [Elliott et al., 2011].) These tests were conducted because comparing the full intervention and control groups maximizes power, which leads to the most sensitive test of the intervention effect. Injunctive norms and stage of change are categorical, and were tested via chi square analyses at baseline and follow-up (and separately by gender). Second, after these analyses, a 2 (intervention group) by 2 (time) by 2 (gender) repeated measures ANOVA was used to examine the differences between full-assessment intervention and control groups, taking *baseline* values into account (conditions receiving brief

assessment could not be included due to lack of baseline data). This analysis takes into account any significant (or non-significant) baseline differences between conditions, and thus was deemed useful in conjunction with the initial maximally-powered ANOVAS that do not account for baseline.

A slightly different set of analyses had been planned in the event of assessment reactivity. A set of 2 (intervention group) by 2 (assessment condition) by 2 (gender) ANOVAs on follow-up outcome variables was planned to determine the effect of intervention vs. assessment on outcome (taking gender into account). Then, to consider the effect of intervention and gender over time (for those who completed full assessment at baseline), a set of 2 (intervention group) by 2 (time) by 2 (gender) analyses was planned.

As a supplementary analysis, correlations were run to evaluate the association between social desirability and all continuous outcome and mediator variables. For correlations that were significant, ANOVAs were re-run incorporating social desirability as a covariate to determine if this altered significance findings.

*Effect Sizes.* Standardized effect sizes were calculated to determine the within groups' changes over time and between-group differences at follow-up. The formula to calculate within-group effect sizes is the difference of the means (follow-up minus baseline) divided by the standard deviation of the differences between the means (Lipsey & Wilson, 2001). The between-group effect sizes were calculated by comparing the intervention and control groups at follow-up (by dividing the difference in means by the pooled standard deviation). To calculate the between-groups effects—controlling for baseline differences—the control within-group effect size was subtracted from the intervention within-group effect size to arrive at the final effect size (Scott-Sheldon, 2010). Results were interpreted by using Cohen's popular criteria for small ( $d \leq 0.20$ ),

medium ( $d = 0.50$ ), and large effects ( $d \geq 0.80$ ) (Lipsey & Wilson, 2001). Where gender accounted for a significant amount of variance, effect sizes were also calculated using partial eta squared (Cohen, 1973; Kennedy, 1970). Partial eta squared provides the benefit of taking into account more than one possible source of variance, and is useful for considering the effects of intervention versus gender in the current study (c.f. Levine & Hullett, 2002).

*Moderation Analyses.* Moderation analyses were run to evaluate possible differential effectiveness of the intervention for certain subgroups. They were run by evaluating interactions using 2 (intervention condition) x 2 (moderator) x 2 (gender) ANOVAs on post-intervention values. Four potential moderators were tested: family history of substance abuse (positive versus negative), stage of change at baseline (precontemplation versus later stages), use level at baseline (dichotomized to high versus low by dividing at the median), and semester (fall versus spring). Significant interaction effects between group and moderator were interpreted as indicating differential efficacy, and means were examined to determine which groups experienced greater benefits. Group by moderator by gender interactions were also considered to determine if males and females in different moderator subgroups responded differently to the conditions.

*Mediation analyses.* In the event that intervention and control groups differed on the marijuana involvement outcomes, mediation analyses were planned to assess potential mediators. Mediation analyses were planned to determine if changes in perceived norms account for the intervention effects on outcome variables (use, problems, abuse and dependence symptoms). Mediation procedures were planned according to instructions by Baron and Kenny (1986). Specifically, Baron and Kenny outline certain conditions that must be met for mediation (as tested in a series of regression analyses): (a) the independent variable must affect the proposed mediator; (b) the independent variable must affect the dependent variable; (c) the mediator must

affect the dependent variable; and (d) the association between the independent and dependent variables decreases when the mediator is taken into account. If the effect is fully mediated, the effect of the independent variable on the dependent variable becomes nonsignificant when the mediator is introduced. Though cause-and-effect is most convincingly suggested by the three variables being measured at three different time points, the current study was limited in its two-part design. The independent variable, condition, was determined at baseline. The mediator, change in perceived norms, reflected the change in norms from baseline to follow-up. The dependent variables (e.g., marijuana use, problems, abuse and dependence symptoms) were measured at follow-up. Analyses of pros and cons as potential mediators were also planned in the event of significant intervention effects on marijuana involvement. As pros and cons are closely tied to stage of change and marijuana involvement, and the intervention targets decisional balance as one of its components, pros and cons were considered as possible mediators of intervention success, also using procedures outlined by Baron and Kenny.

## Results

### *Satisfaction / Treatment Acceptability*

Of the 149 individuals completing the e-TOKE intervention, only 84 (56%) remembered doing so; these students filled out further information about the program. The average time to complete the survey was 22.30 ( $SD = 11.42$ ) minutes, though reports ranged from 1 to 60 minutes. On average, they reported giving the intervention “some” attention ( $M = 3.48$ ,  $SD = 0.90$ ; 1 = minimal; 3 = some; 5 = a lot). In reporting utility of intervention components (0 = not at all useful; 4 = very useful), they gave moderate ratings to normative feedback ( $M = 2.24$ ,  $SD = 1.23$ ) and feedback on money spent on use ( $M = 2.27$ ,  $SD = 1.24$ ). They gave lower ratings to sections that encouraged them to consider how they spend their time ( $M = 1.72$ ,  $SD = 1.23$ ) and

to consider ways to decrease use ( $M = 1.28$ ,  $SD = 1.16$ ). They gave the lowest rating to the page of contact information for campus resources ( $M = 1.08$ ,  $SD = 1.26$ ). Participants also rated their satisfaction with elements of the program (0 = I strongly disagree; 4 = I strongly agree). They were highly satisfied with the online format ( $M = 3.42$ ,  $SD = 0.86$ ) and ease of use ( $M = 3.34$ ,  $SD = 0.75$ ). They were moderate in their satisfaction with the length of the program ( $M = 2.20$ ;  $SD = 1.12$ ) but somewhat unlikely to recommend it to friends ( $M = 1.67$ ,  $SD = 1.27$ ).

### *Descriptives*

All participants had used marijuana in the month preceding baseline assessment, on an average of 11 days ( $SD = 11.8$ , range 1 - 30). Their most frequently reported methods of use were using a joint or blunt (40%), pipe (33%), or vaporizer (11%), with consumption in food (4%), hookah (3%) and other (7%) means less frequently reported. Students had begun using at about age 16 ( $SD = 1.59$ ; range 10-20), and had used for about 3.2 years ( $SD = 1.65$ ). Most students were either somewhat (26%) or very (50%) convinced that marijuana should be legal; 11% expressed uncertainty and 12% felt it should be illegal. Students also reported involvement with other substances, with 95% having used alcohol in the last month, 42% reporting cigarette use, and 21% reporting other illicit drug use in this timeframe.

### *Normality*

The major continuous variables were considered for normality by evaluating skew. Pros, cons, marijuana use frequency, problems, abuse symptoms, dependence symptoms, and all descriptive norms items were evaluated at both baseline and follow-up, along with social desirability at baseline. (Injunctive norms and stage of change were not continuous variables.) Histograms were examined, and skewness tests were run, using a conservative alpha of 0.01 (consistent with the recommendations of Tabachnick & Fidell, 2007, page 80). Normality was

confirmed for pros at baseline and follow-up, cons at baseline, social desirability, and most descriptive norms items. Log, inverse, and square root transformations were run for skewed variables, with reflections being used before transformations for negatively skewed variables that did not respond to the transformations alone (c.f. Tabachnick & Fidell, 2007, page 88). Log transformations reduced skew for problems at follow-up, dependence symptoms at baseline and follow-up, and marijuana frequency at baseline. Square-root transformations reduced skew for cons at follow-up, problems at baseline, abuse symptoms at baseline and follow-up, frequency at follow-up, and a descriptive norms item; a reflection and square root transformation was used for another descriptive norms item at baseline and follow-up. Inverse transformations were not helpful for any variables. Analyses are performed with and without these transformations, and when the same, results are presented for untransformed data for ease of interpretation. See Table 1 for normality analyses and transformations.

### *Attrition*

Attrition analyses were conducted for both e-TOKE completion and completion of the follow-up survey (see Table 2). T-tests and Fisher's Exact tests were used, given the small sample sizes of nonparticipating and discontinuing participants. Results were consistent regardless of whether transformed vs. untransformed values were used.

Of 161 participants assigned to receive the e-TOKE program, participation was confirmed for 158 (98.1%), and unconfirmed for three (indicating that they either did not complete the program or did not enter the correct token number to confirm their participation). Two of the three who did not complete the program were in the e-TOKE full assessment condition; one was in the e-TOKE brief assessment condition. Participants did not differ on age, gender, year in school, whether they lived on campus or studied psychology, GPA, work status,

student (full/part time) status, use frequency, marijuana problems, abuse or dependence symptoms, pros, cons, descriptive or injunctive norms, nor social desirability ( $p > 0.05$ ), but did differ in ethnicity ( $p < 0.01$ ) and opinion of marijuana legality ( $p < 0.05$ ). Two of the three participants who did not confirm were Hispanic/Latino; the third was African American. Those who did not confirm were more likely to believe marijuana should be illegal.

Of the 317 participants who participated in the baseline survey, 312 (98.4%) also completed the follow-up survey. Of those who did not complete the follow-up survey, one was in the e-TOKE full assessment condition, two were in the e-TOKE brief assessment condition, and two were in the control brief assessment condition. Completers and non-completers did not differ on any of the baseline variables considered.

#### *Baseline equivalency and effectiveness of randomization*

All conditions were compared for baseline differences in demographics and social desirability; conditions receiving full assessment were also compared for other substance use variables (see Table 3). No baseline differences existed, with only a marginal difference in year in school ( $p = 0.05$ ), suggesting that randomization was successful in establishing baseline equivalency of conditions. Results were the same with transformed versus untransformed variables.

#### *Assessment reactivity*

First, all continuous dependent variables were evaluated for the possibility of an assessment effect – or assessment by intervention effect – by running factorial ANOVAs. Neither assessment effects nor interactions were found for any continuous variables ( $ps > 0.10$ ); results remained the same when transformed variables were used. Next, follow-up values were compared between intervention conditions, and then between control conditions, as an additional



confirmation. Due to the large amount of analyses (17 analyses plus seven transformed analyses for intervention analyses and the same for control, yielding 48 total analyses), a conservative alpha of 0.01 was used. No values reached this level of significance (see Table 4). Given nonsignificant assessment reactivity results, assessment conditions are collapsed for several of the primary analyses.

*Primary Analyses: Intervention Effectiveness*

ANOVAs on dependent variables with intervention, gender, and intervention by gender interactions as predictors were run; tests on transformed variables are presented given some discrepancies with untransformed variable analyses. See Table 5 for full results. The intervention did not result in different marijuana use frequency ( $F[1, 292] = 0.05, p = 0.82$ ), problems ( $F[1, 213] = 0.08, p = 0.78$ ), abuse ( $F[1, 155] = 0.06, p = 0.80$ ), dependence ( $F[1, 180] = 0.49, p = 0.49$ ), pros ( $F[1, 300] = 0.72, p = 0.40$ ), or cons ( $F[1, 301] = 0.91, p = 0.34$ ). However, there were significant intervention differences for all descriptive norms items, with participants who took e-TOKE reporting less exaggerated norms. Specifically, intervention participants thought fewer people used more than them ( $F[1, 299] = 24.13, p < 0.01$ ), and more people used less ( $F[1, 300] = 14.66, p < 0.01$ ). They guessed a higher number of abstainers ( $F[1, 300] = 31.38, p < 0.01$ ), and thought fewer had used in the past month ( $F[1, 300] = 31.10, p < 0.01$ ) and in their lifetime ( $F[1, 300] = 25.84, p < 0.01$ ). Men and women did not differ by marijuana abuse symptoms ( $F[1, 155] = 0.77, p = 0.38$ ), or descriptive norms items addressing perceived rates of abstention ( $F[1, 300] = 0.05, p = 0.82$ ), past month use ( $F[1, 300] = 0.08, p = 0.78$ ), or lifetime use ( $F[1, 300] = 0.06, p = 0.81$ ). They were also similar on pros ( $F[1, 300] = 0.60, p = 0.44$ ) and cons ( $F[1, 301] = 1.84, p = 0.18$ ) of use. However, men used more frequently ( $F[1, 292] = 13.43, p < 0.01$ ), and reported more problems ( $F[1, 213] = 13.99, p < 0.01$ ) and dependence symptoms

( $F[1, 180] = 11.91, p < 0.01$ ) than women. Not surprisingly given the discrepancy in use frequency, men and women also differed on their perception of the percentage of their peers who used more ( $F[1, 299] = 6.77, p < 0.01$ ) and less ( $F[1, 300] = 6.22, p < 0.05$ ) than themselves. Condition by gender interactions were significant for problems, abuse, and pros. There was a minimal difference in problems between conditions for men ( $p = 0.17$ ); there was a wider gap for females (which attained marginal significance,  $p = 0.07$ ). Men in the e-TOKE condition reported *more* abuse symptoms at follow-up than those in the control condition; the opposite was true for women. Males in the e-TOKE condition reported more pros at follow-up than the control condition; women in the e-TOKE condition reported fewer pros. Injunctive norms responses and stage of change (tested via chi squared analyses) did not differ by condition, at baseline or follow-up. Parallel sets of analyses for baseline and follow-up were also conducted separately for males only and females only, and no additional findings emerged.

Groups with full baseline assessment were then compared using factorial ANOVAS (condition x time x gender). This was to show if the sensitivity afforded by repeated measures data might reveal intervention differences across time. Full results can be found in Table 6. Results were considered for the interactions of condition by time (i.e., whether there was differential change between conditions from baseline to follow-up), gender by time (i.e., whether women and men changed differentially between baseline and follow-up), and condition by gender by time (i.e., whether men and women changed differentially between baseline and follow-up based on condition). The conditions changed differentially over time for three of the descriptive norms items but did not differentially change on any other variables. Participants taking e-TOKE reduced their estimates of the number of students using more than them, while control participants remained constant ( $F[1, 308] = 6.45, p < 0.05$ ). Participants taking e-TOKE

increased their estimates of the number of abstainers whereas control participants did not ( $F[1, 308] = 5.76, p < 0.05$ ). Finally, e-TOKE participants decreased their estimates of the prevalence of recent use whereas control individuals did not ( $F[1, 308] = 4.42, p < 0.05$ ). Time by gender analyses, as well as condition by time by gender analyses, were all nonsignificant.

### *Social Desirability*

Correlations were run between social desirability and all continuous outcome and mediator variables (see Table 7). Social desirability was significantly related to problems, abuse, and dependence symptoms, and unrelated to marijuana use frequency, pros, cons, and all descriptive norms items. ANOVAs were re-run with social desirability as a covariate for problems, abuse, and dependence symptoms analyses. Intervention effects remained nonsignificant when social desirability was included as a covariate (problems:  $F[1, 194] = 0.42, p = 0.52$ ; abuse symptoms:  $F[1, 136] = 0.58, p = 0.45$ ; dependence symptoms:  $F[1, 165] = 1.27, p = 0.26$ ).

### *Effect sizes*

First, effect sizes were calculated for the participants completing full assessments at both time points (see Table 8). Control participants showed minimal to small changes for all variables except problems; control participants reported more problems at the second time point (small-to-medium effect). Participants completing e-TOKE evidenced minimal to small effects for marijuana use frequency, problems, abuse symptoms, dependence symptoms, and cons, but medium changes in the desired direction ( $ds: 0.41 - 0.61$ ) for all descriptive norms responses. Intervention participants also reported fewer pros of marijuana at follow-up (small-to-medium effect). Between-groups effects corrected for baseline values yielded minimal to small effects for

all items besides descriptive norms, which evidenced effects in favor of the e-TOKE condition, and of medium magnitude ( $d$ s: 0.33 – 0.56).

Next, between-groups effect sizes were calculated for the full sample. As not all participants completed baseline assessment, these analyses were not corrected for baseline values. Results were similar to between-group analyses corrected for baseline, with minimal to small effects for all variables except descriptive norms, which again evidenced scores in the medium range ( $d$ s: 0.46 – 0.63).

Partial eta-squared effect sizes were then calculated to separate out variance for intervention condition versus gender in analyses where gender was significant. Transformed variables were used for these analyses, as they were based on ANOVAs presented above, which also used transformed variables. Variables that had previously demonstrated a significant effect of gender (or a significant gender by condition interaction) were marijuana frequency, problems, abuse and dependence symptoms, the first two descriptive norms variables, and pros. Thus, for these variables, partial eta-squared effect sizes were deemed useful in separating out variance. For frequency, gender (partial  $\eta^2 = 0.04$ ) accounted for much more variance than condition (partial  $\eta^2 = 0.0002$ ); the same was true for problems (gender: partial  $\eta^2 = 0.06$ ; condition: partial  $\eta^2 = 0.0004$ ), abuse symptoms (gender: partial  $\eta^2 = 0.005$ ; condition: partial  $\eta^2 = 0.00006$ ), and dependence symptoms (gender: partial  $\eta^2 = 0.06$ ; condition: partial  $\eta^2 = 0.003$ ). For pros, approximately equal amounts of variance were accounted for by gender (partial  $\eta^2 = 0.002$ ) and condition (partial  $\eta^2 = 0.002$ ). Condition accounted for more variance than gender for the descriptive norms items addressing perceived percentage of students using more (gender: partial  $\eta^2 = 0.02$ ; condition: partial  $\eta^2 = 0.07$ ) and less (gender: partial  $\eta^2 = 0.02$ ; condition: partial  $\eta^2 = 0.05$ ) than the respondent.

### *Moderation analyses*

Moderation analyses were run to examine the possible moderating effects of family history, stage of change, use level at baseline, and semester on all dependent variables measured at follow-up. Factorial ANOVAs for condition, moderator, and gender were run; the condition by moderator interactions were evaluated, as were the condition by moderator by gender interactions (see Table 9). For family history, the only significant interaction was a condition by family history by gender interaction for pros ( $F[1, 296] = 7.27, p < 0.01$ ). Men completing e-TOKE were *more* likely to report pros at follow-up than control participants, especially if they were family history negative. However, women completing e-TOKE were *less* likely to report pros at follow-up than controls, especially if they were family history negative. The only significant moderating effect for stage of change was a condition by stage of change interaction for one descriptive norm item (estimated percentage of peers using in the last month) ( $F[1, 295] = 4.07, p < 0.05$ ). Individuals in precontemplation made less of a change in their estimate following the intervention than individuals in later stages of change. Neither baseline use nor semester of data collection served as a moderator for any dependent variables. (It should be noted that, due to the number of analyses calculated, significant results may have been due to chance.)

### *Mediation analyses*

Mediation analyses had been planned to assess the possible roles of perceived norms and decisional balance (pros, cons) in mediating intervention effects on marijuana behaviors and symptomology. There were intervention effects on one of the hypothesized mediators (descriptive norms), but not the other (decisional balance). However, since none of the main intervention effects for marijuana behaviors, problems, or abuse/dependence symptoms were

significant, mediation analyses are not appropriate (i.e., there were no significant effects to mediate), and thus such analyses were not conducted.

*Post-hoc analysis: Differences by risk status*

Post-hoc analyses were conducted to determine whether e-TOKE was more effective in changing use, problems, abuse, and/or dependence symptoms among higher-risk participants. Thus, subgroups of individuals meeting DSM-IV-TR abuse and dependence criteria were analyzed for significance in these domains. All findings were non-significant,  $ps > 0.05$ .

*Post-hoc analysis: Dosage effects*

Post-hoc analyses were conducted to determine whether e-TOKE was differentially effective in changing use, problems, abuse, and/or dependence symptoms for those who did not remember the program, those who remembered it but spent minimal time completing it (less than 20 minutes), and those who spent adequate time completing it (20 minutes or more). There were no differences among groups,  $ps > 0.05$ .

## Discussion

In general, this study found mixed support for the e-TOKE program. Students appeared to appreciate the online format of e-TOKE, and found the program easy to use. They also found the feedback components to be moderately useful. Regarding intervention effectiveness, the current study found the intervention to be useful in changing students' perceptions of others' marijuana involvement, as evidenced by changes (of medium magnitude) in descriptive norms. However, exposure to e-TOKE did not produce changes in use, problems, abuse symptoms, dependence symptoms, or injunctive norms at the one-month follow-up.

The lack of change in marijuana involvement is somewhat surprising, given related literature. Also, we recruited a relatively heavily using sample, which allowed room for change.

The (limited) research on web-based interventions for marijuana have yielded some encouraging findings (Budney et al., 2011; Kay-Lambkin et al., 2008; Tossmann et al., 2011), though the only other research study with (incoming) college students also yielded no main intervention effects (Lee et al., 2010). Though this may suggest that web-based interventions are less effective with college students, such a hypothesis would be unexpected given the support found for alcohol-based web-interventions in college populations (Carey et al., 2009). Another explanation for why the intervention did not influence use could be that a substantial number of students did not even remember completing the program (44%), and most of those who did remember it did not find it worth recommending to friends. These findings temper the support for the program created by high usability and utility ratings. However, due to the promise of web-based substance use interventions for college students in general, as well as the fact that the present study is the only known study assessing the effectiveness of such an intervention with *current* college students, more research is indicated before making conclusive statements.

In contrast, the intervention *was* found to be useful in changing descriptive norms, suggesting that there are educational benefits to administering such a program to college students. This change suggests participants were exposing themselves to the content, were influenced by it, and thus could potentially benefit from interventions like this. The possibility that changes in descriptive norms may mediate changes in later use should be considered, given that this is a common phenomenon in the college drinking literature (Lewis & Neighbors, 2007; Neighbors et al., 2004; Neighbors, Lewis, Bergstrom, & Larimer, 2006; Walters, Vader, & Harris, 2007). This seems to be a reasonable hypothesis, given the correlation of marijuana descriptive norms with personal use (e.g., Kilmer, et al., 2006). An optimal test for future

research would involve a short-term measure of norms change (as performed in the present study), with another follow-up assessment at a later time point to measure use.

The moderator analyses also yield some insights. In general, women were more responsive to the intervention; they reduced problems, abuse symptoms, and pros of marijuana use whereas men increased or stayed the same. Family history negative men and women reacted differently to the e-TOKE intervention, with men reporting more pros at follow-up and women reporting fewer pros at follow-up. This suggests that individuals exposed to the intervention who do not have a predisposition to substance use problems may react in gender specific ways, with men becoming more extreme in their current appreciation of marijuana, and women responding in the intended direction. Thus, it may be more difficult to break through the attitudes of men who do not feel at risk, whereas women may be more responsive, even if not at risk. Another moderation finding suggested that individuals in later stages of change may be more responsive to descriptive norms intervention. This is consistent with previous literature (e.g., Lee et al., 2010) that found greater change in individuals with more readiness to change.

It should be noted that this study serves as an effectiveness test, as opposed to an efficacy test (c.f., Kazdin, 2003). The current study allowed participants to complete the intervention in settings of their own choosing, which is most comparable to how this intervention is used in the “real world.” Of course, certain sacrifices are made with such a test, such as ability to closely control the environment (e.g., environmental disruptions, substance use whilst taking the assessment and intervention). Given the current popularity of this intervention program across the country, effectiveness was judged as having more practical importance than efficacy. However, given the nonsignificant results, one may wonder if this was too ambitious as a first



evaluation of the program. Perhaps an efficacy test in a closely controlled environment may have yielded stronger effects; this may be worthy of future study.

The present study has certain strengths. This study served as a preliminary (or pilot) test of an intervention that is widely used but understudied. It is important to determine if interventions work if they are to be widely distributed and utilized. The design was strong; it was a randomized controlled study that evaluated intervention effectiveness as well as assessment reactivity (which was likely nonsignificant due to low frequency and intensity of assessment). The study design also accounted for gender in analyses, and assessed differential effectiveness by participant variables such as family history and stage of change. The study also evidenced excellent compliance, with low attrition, minimizing concern about selective dropout. Effect sizes were considered, in order to determine magnitude of effects in case significance tests were limited by sample size.

Of course, the current study is subject to limitations. First, the one-month timeframe proved to be too short to detect change if the intervention was effective in changing marijuana involvement. It is possible that changes in use may have emerged over the course of subsequent months, or even a year, which were not detected by the present study. It is unlikely that one month was too long, as the use and problem indicators assessed involvement over that full one-month period (which thus would have picked up on brief changes in the week after intervention). Also, reductions short enough to disappear in one month are unlikely to be of practical importance. Second, as mentioned above, effectiveness designs sacrifice the opportunity to control the environment of the individual completing the program, such as distractions from roommates or concurrent television viewing. Thus, the external validity was prioritized, which led to certain limitations in our control over the conditions of the experiment. Third, it is unclear

how well the current sample accurately represented how this intervention would be used in the “real world,” which may have tempered the effects. Universities are welcome to use e-TOKE in whatever way they find most useful, which may involve administering to all students, targeting individuals at risk, or posting on their counseling center website. It is thus unclear how well self-selected psychology students represent the population using this intervention in a true clinical context. Fourth, self-report measures have inherent limitations in their ability to fully capture behavior honestly and accurately; a social desirability scale was used to detect self-presentation bias and did indicate that this phenomenon occurred but did not alter significance results.

Due to the nascent nature of this area of study, this study suggests many future directions. First, a natural extension of this research is to assess whether e-TOKE changes use and problem indicators further in the future, such as several months or even a year later. This may be the case if descriptive norms serve as a mediator; changes in descriptive norms could lead to changes in marijuana involvement at a later period of time. Alternatively, this intervention may begin consideration of change, with the change itself occurring at a later time. Though Lee and colleagues’ (2010) study suggests that a later follow-up may still not yield main effects, it would be worthwhile to examine this with the e-TOKE intervention specifically, given its widespread use. Also, Lee and colleagues suggest that efficacy may be found at later follow-ups for certain subgroups. Second, given that many participants did not remember the intervention at a later time, even future research with longer follow-ups would benefit from assessments of *satisfaction* administered immediately after intervention completion. Third, another area of study involves whether this intervention is useful for certain sub-populations of college students. Researchers may wish to examine whether e-TOKE is useful as a preventive measure for students who have not yet initiated marijuana use. There is some preliminary evidence that the e-TOKE program

leads to changes in descriptive and injunctive norms (but not use initiation rates) in abstainers (Elliott & Carey, manuscript in progress). Also of interest is whether the intervention is useful for individuals who have gotten into legal trouble, or individuals seeking help, as these are sub-populations that may be particularly likely to be referred to such a program. One might even consider the possibility that reason for use may moderate effect. For example, social users may respond more to norm manipulation than individuals using for medicinal purposes. Fourth, closely controlled efficacy tests are indicated to determine if the study evidences results under optimal conditions; beginning with an effectiveness test may have served as too stringent an initial test to detect change.

In conclusion, the e-TOKE intervention shows promise for effectiveness in correcting students' misperceptions about marijuana use. However, its primary purpose is to alter marijuana behaviors and consequences. Though it has not attained these goals in the current study, the brief timeframe of the current study suggests that the effects on behavior (if any) may appear after one month. Furthermore, wide use of the intervention indicates that further investigation would be useful. If support for e-TOKE is found, this intervention could be an easily disseminated, convenient, and useful tool for college campuses.

Table 1

*Skewness P-Values for Raw and Transformed Data*

Variable	Raw / Untransformed	Log Transformed	Inverse Transformed	Square Root Transformed
Pros – BL	<b><i>0.0412</i></b>	0.0000	0.0000	0.0003
Pros – FP	<b><i>0.0137</i></b>	0.0000	0.0000	0.0000
Cons – BL	<b><i>0.0325</i></b>	0.0723	0.0000	0.8600
Cons – FP	0.0011	0.0329	0.0000	<b><i>0.5244</i></b>
Problems – BL	0.0000	0.0706	0.0000	<b><i>0.8435</i></b>
Problems – FP	0.0000	<b><i>0.9415</i></b>	0.0000	0.0099
Abuse Sxs – BL	0.0000	0.0001	0.0005	<b><i>0.7867</i></b>
Abuse Sxs – FP	0.0000	0.0000	0.0000	<b><i>0.0687</i></b>
Dependence Sxs - BL	0.0013	<b><i>0.6605</i></b>	0.1601	0.0584
Dependence Sxs - FP	0.0000	<b><i>0.7259</i></b>	0.0009	0.3917
Social Desirability	<b><i>0.5484</i></b>			
Use Frequency – BL	0.0000	<b><i>0.5989</i></b>	0.0000	0.0004
Use Frequency – FP	0.0000	0.0104	0.0000	<b><i>0.4545</i></b>
Descriptive norms				
Item 1 – BL	<b><i>0.3388</i></b>			
Item 2 – BL	<b><i>0.8199</i></b>			
Item 3 – BL	<b><i>0.3170</i></b>			
Item 4 – BL	<b><i>0.1070</i></b>			
Item 5 – BL */reflected	0.0000/ 0.0000	0.0000/ 0.0001	0.0000/ 0.0000	0.0000/ <b><i>0.0192</i></b>
Item 1 – FP	0.0000	0.0000	0.0000	<b><i>0.4426</i></b>
Item 2 – FP	<b><i>0.0259</i></b>	0.0000	0.0000	0.0000
Item 3 – FP	<b><i>0.4032</i></b>			
Item 4 – FP	<b><i>0.2078</i></b>			
Item 5 – FP */reflected	0.0000/ 0.0000	0.0000/ 0.0000	0.0000/ 0.0000	0.0000/ <b><i>0.5900</i></b>

*Notes.* BL = baseline, FP = Follow-up. Chosen untransformed or transformed versions of variables are bolded and italicized for each row. “\*/reflected” means that due to negative skew, the variable was reflected and then transformed, with these p values presented as well in that row after slash.

Table 2

*Attrition Analyses by e-TOKE Confirmation and Follow-up Completion*

Variable name	e-TOKE confirmation		Follow-up Completion	
	Confirmed <i>n</i> = 158	Not confirmed <i>n</i> = 3	Completed <i>n</i> = 312	Not completed <i>n</i> = 5
Age – M(SD)	19.25 (1.14)	20 (1.73)	19.35 (1.21)	19.25 (1.89)
Gender (%female)	50	33	52	60
Ethnicity (% white)	<b>80</b>	<b>0</b>	78	60
Year				
% Freshman	41	33	42	40
% Sophomore	33	33	26	40
% Junior	15	0	19	0
% Senior +	10	33	13	20
% Living on campus	78	66	76	80
% Studying psychology	21	33	21	40
GPA – M(SD)	3.46 (2.61)	2.5	3.34 (1.90)	3.02 (0.84)
% Employed	24	66	27	25
% Full-time student	100	100	99	100
Use frequency	11.06 (10.15)	5	11.09 (11.83)	7
Opinion on MJ legality (1=no, 5=yes)	<b>4.06 (1.19)</b>	<b>2.67 (0.58)</b>	4.07 (1.21)	4.5 (1.0)
MJ Problems – M(SD)	6.62 (6.15)	4 (5.66)	6.17 (5.74)	0
MJ Abuse symptoms – M(SD)	0.83 (0.81)	0.00 (0.00)	0.83 (0.89)	0
MJ Dependence symptoms – M(SD)	2.20 (1.82)	1.5 (0.71)	2.16 (1.78)	3
Perceived Pros of MJ – M(SD)	3.60 (0.79)	3.56 (0.97)	3.59 (0.81)	1.5
Perceived Cons of MJ – M(SD)	2.53 (0.88)	2.53 (0.31)	2.49 (0.85)	1.69
Descriptive Norms items				
% Uses more than you	41.83 (22.88)	35.0 (7.07)	41.98 (23.67)	40
% Uses less than you	50.57 (25.53)	60.0 (0.0)	49.81 (25.78)	60
% Don't use in typical month	39.87 (21.75)	46.0 (50.91)	38.48 (21.46)	30
% Used in past month	57.88 (20.20)	44.0 (36.77)	58.39 (19.90)	30
% Used in lifetime	75.85 (19.59)	78.5 (9.19)	77.19 (19.13)	40
Injunctive Norms items				
% Approve if abstain	19	50	18	0
% Approve if use 1-2x	35	0	34	0
% Approve occasional use	31	0	34	0
% Approve regular use	16	0	19	0
Social Desirability	5.96 (2.80)	6.33 (0.58)	6.17 (2.71)	6.8 (3.03)

*Notes.* Final column may include mean without standard deviation if sample size is less than three. Percentages may include rounding error. Significant differences ( $p < 0.05$ ) are bolded and italicized. Significance findings remained the same when transformed variables were used.

Table 3

*Significance Tests for Baseline Equivalence / Effectiveness of Randomization*

Variable name	e-TOKE, full ass't <i>n</i> = 77	e-TOKE, brief ass't <i>n</i> = 84	Control, full ass't <i>n</i> = 85	Control, brief ass't <i>n</i> = 71	Test statistic	Significance
Age – M(SD)	19.45(1.21)	19.11 (1.09)	19.31 (1.24)	19.55 (1.31)	$F(3, 301) = 1.89$	$p = 0.13$
Gender (% female)	47	52	49	63	$X^2(3) = 4.49$	$p = 0.21$
Ethnicity (% White)	79	77	81	75	$X^2(18) = 19.47$	$p = 0.36$
Year					$X^2(12) = 21.02$	$p = 0.05$
% Freshman	34	47	49	36		
% Sophomore	39	28	19	19		
% Junior	13	17	19	28		
% Senior+	13	8	13	17		
% On campus	75	81	76	72	$X^2(3) = 1.72$	$p = 0.63$
% Studying psychology	16	25	18	27	$X^2(3) = 3.86$	$p = 0.28$
GPA – M(SD)	3.70(3.76)	3.23(0.46)	3.16(0.59)	3.30(0.38)	$F(3, 298) = 1.22$	$p = 0.30$
% Employed	22	28	23	35	$X^2(3) = 4.36$	$p = 0.23$
% Full time students	100	100	99	97	$X^2(3) = 4.11$	$p = 0.25$
Use frequency <sup>a</sup> – M(SD)	10.97(10.11)	-	11.14(13.16)	-	$F(1, 154) = 0.01$	$p = 0.93$
Opinion on MJ legality (1=no, 5=yes)	3.97(1.24)	4.09(1.15)	4.07(1.28)	4.18(1.15)	$F(3, 310) = 0.37$	$p = 0.77$
MJ Problems <sup>a</sup> – M(SD)	6.55(6.12)	-	5.72(5.36)	-	$F(1, 153) = 0.81$	$p = 0.37$
MJ Abuse symptoms <sup>a</sup> – M(SD)	0.81(0.81)	-	0.85(0.96)	-	$F(1, 160) = 0.09$	$p = 0.77$
MJ Dependence symptoms <sup>a</sup> – M(SD)	2.18(1.80)	-	2.14(1.76)	-	$F(1, 160) = 0.02$	$p = 0.88$
Perceived Pros of MJ <sup>a</sup> – M(SD)	3.60(0.79)	-	3.56(0.86)	-	$F(1, 160) = 0.08$	$p = 0.77$
Perceived Cons of MJ <sup>a</sup> – M(SD)	2.53(0.87)	-	2.44(0.83)	-	$F(1, 160) = 0.42$	$p = 0.52$
Descriptive Norms items <sup>a</sup>						
% Uses more than you	41.65(22.62)	-	42.25(24.58)	-	$F(1, 160) = 0.03$	$p = 0.87$
% Uses less than you	50.82(25.23)	-	49.01(26.27)	-	$F(1, 160) = 0.20$	$p = 0.66$
% Don't use in typical month	40.03(22.26)	-	36.99(20.63)	-	$F(1, 160) = 0.81$	$p = 0.37$
% Used in past month	57.52(20.49)	-	58.85(19.57)	-	$F(1, 160) = 0.18$	$p = 0.67$
% Used in lifetime	75.92(19.36)	-	77.89(19.29)	-	$F(1, 160) = 0.42$	$p = 0.52$
Injunctive Norms items <sup>a</sup>						
% Approve if abstain	19	-	-	-	$X^2(2) = 0.32$	$p = 0.85$
% Approve if use 1-2x	34	-	33	-	$X^2(1) = 0.01$	$p = 0.91$
% Approve occasional use	30	-	36	-	$X^2(2) = 0.79$	$p = 0.67$

% Approve regular use	16	-	21	-	$X^2(2) = 0.93$	$p = 0.63$
Social Desirability	6.04(2.82)	5.90(2.74)	6.51(2.66)	6.3(2.62)	$F(3, 304) = 0.79$	$p = 0.50$

*Notes.* Significance findings remained the same when transformed variables were used. <sup>a</sup>Comparison possible in full assessment conditions only.

Table 4

*Assessment Reactivity Analyses: One-month Follow-up Values by Intervention Condition and Type of Assessment*

	e-TOKE condition		Control condition	
	Full assessment <i>n</i> = 77	Brief assessment <i>n</i> = 84	Full assessment <i>n</i> = 85	Brief assessment <i>n</i> = 71
% Used marijuana	80	86	86	81
Injunctive Norms items				
% Approve if abstain	15	20	19	26
% Approve if use 1-2x	32	28	28	26
% Approve occasional use	34	34	33	26
% Approve regular use	26	23	24	23
Days used in past month – M(SD)	10.01(9.59)	10.90(10.31)	10.90 (11.25)	10.70 (11.56)
MJ problems – M(SD)	7.57 (8.20)	6.01 (6.18)	7.17 (7.79)	7.38 (7.11)
MJ abuse symptoms – M(SD)	0.77 (0.82)	0.68 (0.90)	0.76 (0.89)	0.71 (0.90)
MJ dependence symptoms – M(SD)	1.94 (1.73)	1.73 (1.95)	1.96 (1.85)	2.10 (1.93)
Descriptive Norms items				
% Uses more than you	27.71 (18.66)	28.60 (20.96)	40.98 (23.71)	43.71 (26.49)
% Uses less than you	61.19 (24.87)	63.38 (24.83)	50.98 (25.56)	50 (26.31)
% Don't use in typical month	50.37 (22.20)	51.35 (24.07)	36.31 (21.37)	38.07 (19.05)
% Used in past month	46.84 (22.49)	43.71 (2.51)	57.70 (20.22)	58.72 (18.88)
% Used in lifetime	63.99 (23.22)	60.28 (24.27)	74.26 (20.49)	75.87 (19.97)
Pros – M(SD)	3.29 (0.87)	3.31 (0.94)	3.39 (0.86)	3.34 (0.86)
Cons – M(SD)	2.40 (0.84)	2.43 (0.87)	2.37 (0.75)	2.63 (0.84)

*Notes.* Significance test results remained the same when transformed variables were used.



Table 5

*Differences in Dependent Variables by Intervention Condition and Gender: Means and Standard Deviations*

	Intervention			Gender		Interaction	
	e-TOKE <i>n</i> = 161	Control <i>n</i> = 156	Significance	Male <i>n</i> = 148	Female <i>n</i> = 163	Significance	Significance
Days used in past month	10.47 (9.94)	10.81 (11.35)	ns	13.26 (11.66)	8.51 (9.21)	*	ns
MJ problems	6.72 (7.18)	7.26 (7.47)	ns	8.75 (8.53)	5.45 (5.68)	*	*
MJ abuse symptoms	0.73 (0.86)	0.73 (0.89)	ns	0.80 (0.92)	0.68 (0.83)	ns	*
MJ dependence symptoms	1.82 (1.84)	2.02 (1.88)	ns	2.02 (1.99)	1.87 (1.75)	*	ns
Descriptive Norms items							
% Uses more than you	28.17 (19.82)	42.20 (24.94)	*	31.53 (23.04)	38.06 (23.70)	*	ns
% Uses less than you	62.33 (24.80)	50.54 (25.81)	*	60.54 (26.77)	52.86 (24.85)	*	ns
% Don't use in typical month	50.89 (23.13)	37.10 (20.31)	*	44.85 (24.24)	43.72 (21.26)	ns	ns
% Used in past month	45.20 (22.58)	58.16 (19.57)	*	51.38 (23.56)	51.25 (19.95)	ns	ns
% Used in lifetime	62.05 (23.77)	74.98 (20.21)	*	67.66 (24.31)	68.53 (21.53)	ns	ns
Pros	3.30 (0.90)	3.37 (0.85)	ns	3.36 (0.84)	3.29 (0.91)	ns	*
Cons	2.41 (0.86)	2.49 (0.80)	ns	2.38 (0.81)	2.51 (0.84)	ns	ns

*Note.* Due to some discrepancies, significance tests on transformed variables are presented. For ease of interpretation, non-transformed means and standard deviations are presented in this table.

Table 6

*ANOVA Results for Condition, Time, and Gender in Conditions Completing Full Assessment*

	Baseline		Follow-up		Interactions		
	e-TOKE <i>n</i> = 77	Control <i>n</i> = 85	e-TOKE <i>n</i> = 76	Control <i>n</i> = 85	Condition x Time	Time x Gender	Condition x Time x Gender
Days used in past month	10.97 (10.11)	11.14 (13.16)	10.01 (9.59)	10.90 (11.25)	ns	ns	ns
MJ problems	6.55 (6.12)	5.72 (5.36)	7.57 (8.20)	7.17 (7.79)	ns	ns	ns
MJ abuse symptoms	0.81 (0.81)	0.85 (0.96)	0.77 (0.82)	0.76 (0.89)	ns	ns	ns
MJ dependence symptoms	2.18 (1.80)	2.14 (1.76)	1.94 (1.73)	1.96 (1.85)	ns	ns	ns
Descriptive Norms items							
% Uses more than you	41.65 (22.62)	42.25 (24.58)	27.71 (18.66)	40.98 (23.71)	*	ns	ns
% Uses less than you	50.82 (25.23)	49.01 (26.27)	61.19 (24.87)	50.98 (25.56)	ns	ns	ns
% Don't use in typical month	40.03 (22.26)	36.99 (20.63)	50.37 (22.20)	36.31 (21.37)	*	ns	ns
% Used in past month	57.52 (20.49)	58.85 (19.57)	46.84 (22.49)	57.70 (20.22)	*	ns	ns
% Used in lifetime	75.92 (19.36)	77.89 (19.29)	63.99 (23.22)	74.26 (20.49)	ns	ns	ns
Pros	3.60 (0.79)	3.56 (0.86)	3.29 (0.87)	3.39 (0.86)	ns	ns	ns
Cons	2.53 (0.87)	2.44 (0.83)	2.40 (0.84)	2.37 (0.75)	ns	ns	ns

Table 7

*Correlations between Social Desirability and Continuous Outcome/Mediator Variables*

	Social Desirability
Days used in past month – M(SD)	-0.01
MJ problems – M(SD)	-0.24*
MJ abuse symptoms – M(SD)	-0.22*
MJ dependence symptoms – M(SD)	-0.20*
Descriptive Norms items	
% Uses more than you	0.02
% Uses less than you	-0.01
% Don't use in typical month	-0.01
% Used in past month	0.00
% Used in lifetime	0.03
Pros – M(SD)	-0.09
Cons – M(SD)	-0.05

*Note.* \* Indicates significance at  $p < 0.05$ . Significance findings are the same regardless of transformation. For ease of interpretation, untransformed values are presented.

Table 8  
*Cohen's d Effect Sizes for e-TOKE and Control: Between-group and Within-group Effects*

	Sample: Conditions receiving full assessment (n = 162)			Sample: All participants (n = 312)
	Within effect: e-TOKE (n = 77)	Within effect: Control (n = 85)	Between effect (corrected for baseline values)	Between effect (uncorrected)
Days used in past month	0.09	0.02	0.08	0.03
MJ problems	-0.16	-0.27	0.10	0.07
MJ abuse symptoms	0.05	0.09	-0.04	0.00
MJ dependence symptoms	0.13	0.10	0.03	0.11
Descriptive Norms items				
% Uses more than you	0.61	0.05	0.56	0.62
% Uses less than you	0.41	0.07	0.33	0.46
% Don't use in typical month	0.46	-0.03	0.49	0.63
% Used in past month	0.52	0.06	0.46	0.61
% Used in lifetime	0.61	0.19	0.42	0.58
Pros	0.39	0.20	0.20	0.08
Cons	-0.15	-0.08	-0.06	-0.08

*Note.* Positive effects mean change in the expected (preferred) direction (e.g., fewer problems, more cons).

Table 9

*Moderator Analyses for Family History, Stage of Change, Baseline Use, and Semester*

	Family history		Stage of change		Use at baseline		Semester	
	CxM	CxMxG	CxM	CxMxG	CxM	CxMxG	CxM	CxMxG
Days used in past month	ns	ns	ns	ns	ns	ns	ns	ns
MJ problems	ns	ns	ns	ns	ns	ns	ns	ns
MJ abuse symptoms	ns	ns	ns	ns	ns	ns	ns	ns
MJ dependence symptoms	ns	ns	ns	ns	ns	ns	ns	ns
Descriptive Norms items								
% Uses more than you	ns	ns	ns	ns	ns	ns	ns	ns
% Uses less than you	ns	ns	ns	ns	ns	ns	ns	ns
% Don't use in typical month	ns	ns	ns	ns	ns	ns	ns	ns
% Used in past month	ns	ns	*	ns	ns	ns	ns	ns
% Used in lifetime	ns	ns	ns	ns	ns	ns	ns	ns
Pros	ns	*	ns	ns	ns	ns	ns	ns
Cons	ns	ns	ns	ns	ns	ns	ns	ns

*Notes.* C x M indicates condition by moderator analyses; C x M x G indicates condition by moderator by gender analyses. \* indicates significance at  $p < 0.05$ ; NS indicates nonsignificance. Family history and semester analyses are done on the full sample; stage of change and baseline use analyses are done on the sub-samples completing full assessment at baseline.

## Appendix A



### Department of Psychology Syracuse University

#### Consent Form

Evaluation of a Web-based Intervention for College Marijuana Use  
Investigator: Jennifer C. Elliott, MS; Supervisor: Peter Vanable, PhD

#### **INTRODUCTION AND PROCEDURE**

The purpose of this study is to learn about drug use on college campuses. You will be asked to fill out some online questionnaires that may address attitudes, perceptions and behaviors related to drug use. Some participants may also complete a web-based program designed to help college students think about their drug use. Participation in this study will take an hour or less, and you will receive one hour of research credit toward your psychology research requirement. Participation is completely voluntary, and you have the right to discontinue at any time, without penalty. If you withdraw your participation partway through the study, you will receive half-credit. By clicking to the next screen you are indicating your consent. You may wish to print this screen for your records. You will be sent a second survey in a month, in which you will be asked to fill out some additional questionnaires, and receive an additional half hour of credit. Please leave a half hour of credit unfilled so that this second survey can count toward your requirement.

#### **CONFIDENTIALITY**

You will complete two surveys. Until the second survey, we will need to keep a separate file connecting your email address and participant ID number, so that we are able to contact you for the second survey, which will mean that your data will temporarily be identifiable with access to both databases. At the end of the semester, all of your data will be downloaded to a database without your name, the file connecting your email and ID will be deleted, and no way to connect your data to your identity will remain. All data generated by this study will be stored in secure databases accessible only to investigators.

#### **RISKS AND BENEFITS**

As a result of this study, you will have the opportunity to think about your drug use, which some individuals find helpful in making decisions. You will also be helping us better understand drug use behaviors on college campuses. The researchers are not immune to legal subpoena about illegal activities. Although a very rare occurrence, if law enforcement officials request access to these data, we would have to provide them. It is possible that responding to questions about drug use may cause some discomfort. If you feel uncomfortable answering any of the questions in the surveys, you can decline to answer. In the event that you would like to contact a professional to discuss any concerns you might have, you may contact the following on-campus services: Options at 315-443-4234, the University Counseling Center at 315-443-4715, or the Psychological Services Center at 315-443-3595. Any questions regarding your rights as a research participant can be directed to Syracuse University's Institutional Review Board at 315-443-3013. Any questions about the study itself can be addressed to Jennifer Elliott at [jcelliot@syr.edu](mailto:jcelliot@syr.edu), or Dr. Kate Carey at [kbcarey@syr.edu](mailto:kbcarey@syr.edu).

#### **ALTERNATIVES TO PARTICIPATION**

You do not need to participate in this study. You have the option to decline to participate in this study now, as well as the option to withdrawal your participation partway through the study without penalty, as described above. If you wish to receive research credit for your class but do not want to participate in this study, you may participate in other studies to fulfill your research credit requirement.

By clicking to the next screen, you indicate that all of your questions have been answered and you willingly participate in this research. You also certify that you are at least 18 years old, and that you have had the opportunity to print a copy of this consent form for your records.

## Appendix B

To begin, please provide us with some basic information about yourself.

**Age (as of your last birthday):** \_\_\_\_

**Gender:**  Male  Female

**Ethnicity:**

- White (non-Hispanic)  
 African American  
 Hispanic or Latino  
 Asian or Asian American  
 Native American  
 Other  
 I prefer not to provide this information

**Year in school:**

- First Year / Freshman  
 Second Year / Sophomore  
 Third Year / Junior  
 Fourth Year / Senior  
 Graduate Student  
 Other

Do you live on campus?  Yes  No

Are you majoring in psychology?  Yes  No

GPA (on a 0.0-4.0 scale): \_\_\_\_

**Please answer the following questions to the best of your ability by choosing 'yes' or 'no.'**

	Yes	No
Do you think your biological mother is/was a problem drinker or alcoholic?	<input type="checkbox"/>	<input type="checkbox"/>
Do you think your biological father is/was a problem drinker or alcoholic?	<input type="checkbox"/>	<input type="checkbox"/>
Do you think any of your biological siblings are/were problem drinkers or alcoholics?	<input type="checkbox"/>	<input type="checkbox"/>
Do you think any of your grandparents are/were problem drinkers or alcoholics?	<input type="checkbox"/>	<input type="checkbox"/>
Do you think any of your aunts or uncles are/were problem drinkers or alcoholics?	<input type="checkbox"/>	<input type="checkbox"/>
Do you think any of your cousins are/were problem drinkers or alcoholics?	<input type="checkbox"/>	<input type="checkbox"/>
Do you think your biological mother has/had a problem with drugs?	<input type="checkbox"/>	<input type="checkbox"/>
Do you think your biological father has/had a problem with drugs?	<input type="checkbox"/>	<input type="checkbox"/>
Do you think any of your biological siblings has/had a problem with drugs?	<input type="checkbox"/>	<input type="checkbox"/>
Do you think any of your grandparents has/had a problem with drugs?	<input type="checkbox"/>	<input type="checkbox"/>
Do you think any of your aunts or uncles has/had a problem with drugs?	<input type="checkbox"/>	<input type="checkbox"/>
Do you think any of your cousins has/had a problem with drugs?	<input type="checkbox"/>	<input type="checkbox"/>

## Appendix C

**Please fill in the following information regarding your marijuana use.**

Have you ever used marijuana?  Yes  No

What is the age at which you first used marijuana? \_\_\_\_ years

What is the total number of years you have used marijuana? \_\_\_\_ years

What are your most typical ways of using marijuana (please check all that apply):

Smoking a joint/blunt       Using a pipe       Ingesting in food

Using a vaporizer       Using a hookah       Other

What is the last year you used marijuana (e.g., 2009): \_\_\_\_

(or leave blank if you have never used)

**The next few questions will ask about your use of various substances in the past month. Please think about these items carefully, and give your best estimations. Recalling memorable events in the last month (e.g., birthdays, trips, breaks) may make it easier to remember and answer the questions.**

Please estimate the number of days in which you have used marijuana in the past month:  
\_\_\_\_ days

Please estimate the number of days in which you have used alcohol in the past month:  
\_\_\_\_ days.

Please estimate the number of days in which you have used cigarettes in the past month:  
\_\_\_\_ days.

Please estimate the number of days in which you have used other illegal drugs (besides marijuana and underage drinking) in the past month:  
\_\_\_\_ days.



## Appendix D

Different things happen to people when they are using marijuana, or as a result of their marijuana use. Some of these things are listed below. Please indicate how many times each has happened to you **during the last month** while you were using marijuana or as the result of your marijuana use.

		Never	1-2 times	3-5 times	6-10 times	More than 10 times
1	Got into fights, acted bad, or did mean things.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Went to work or school high.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Caused shame or embarrassment to someone.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Neglected your responsibilities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Relatives avoided you.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Felt that you needed more marijuana than you used to use in order to get the same effect.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Tried to control your marijuana use by trying to use only at certain times of day or certain places.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Had withdrawal symptoms, that is, felt sick because you stopped or cut down on marijuana.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Noticed a change in your personality.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Felt that you had a problem with school.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Tried to cut down on marijuana.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Suddenly found yourself in a place that you could not remember getting to.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Passed out or fainted suddenly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Had a fight, argument, or bad feelings with a friend.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Kept using marijuana when you promised yourself not to.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Felt you were going crazy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Felt physically or physiologically dependent on marijuana.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	Was told by a friend or neighbor to stop or cut down on marijuana.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Appendix E

Please indicate which of the following you have experienced in the last month because of your marijuana use.

	Yes	No
Have a period when your marijuana use or your being sick from your marijuana use often interfered with taking care of your home or family?	<input type="checkbox"/>	<input type="checkbox"/>
Have job or school troubles as a result of your marijuana use—like missing too much work, not doing your work well, being demoted or losing a job, or being suspended, expelled or dropping out of school?	<input type="checkbox"/>	<input type="checkbox"/>
Continue to use marijuana even though you knew it was causing you trouble with your family or friends?	<input type="checkbox"/>	<input type="checkbox"/>
Get into physical fights while under the influence of marijuana?	<input type="checkbox"/>	<input type="checkbox"/>
Have arguments with your spouse, boyfriend/girlfriend, family or friends as a result of your marijuana use?	<input type="checkbox"/>	<input type="checkbox"/>
Accidentally injure yourself while under the influence of marijuana, for example, have a bad fall or cut yourself badly, get hurt in a traffic accident, or anything like that?	<input type="checkbox"/>	<input type="checkbox"/>
More than once drive a car, motorcycle, truck, boat, or other vehicle when you were under the influence of marijuana?	<input type="checkbox"/>	<input type="checkbox"/>
Find yourself under the influence of marijuana or feeling its aftereffects in situations that increased your chances of getting hurt—like swimming, using machinery, or walking in a dangerous area or around heavy traffic?	<input type="checkbox"/>	<input type="checkbox"/>
Get arrested, get held at a police station or have any other legal problems because of your marijuana use?	<input type="checkbox"/>	<input type="checkbox"/>
Find that your usual amount of marijuana had much less effect on you than it once did?	<input type="checkbox"/>	<input type="checkbox"/>
Find that you had to use much more marijuana than you once did to get the		

effect you wanted?	<input type="checkbox"/>	<input type="checkbox"/>
<p>Have any of the following bad aftereffects when the effects of marijuana were wearing off? This includes the morning after using it or in the first few days after stopping or cutting down on it? For example, did you EVER</p> <ul style="list-style-type: none"> <li>• Sleep more than usual?</li> <li>• Feel weak or tired (when the effects of marijuana were wearing off)?</li> <li>• Feel depressed?</li> <li>• Find yourself sweating or your heart beating fast (when the effects of marijuana were wearing off)?</li> <li>• Have nausea, vomiting or a stomach ache?</li> <li>• Yawn a lot (when the effects of marijuana were wearing off)?</li> <li>• Have runny eyes or a runny nose?</li> <li>• Eat more than usual or gain weight (when the effects of marijuana were wearing off)?</li> <li>• Feel anxious or nervous?</li> <li>• Have muscle aches or cramps or diarrhea (when the effects of marijuana were wearing off)?</li> <li>• Have a fever?</li> <li>• Became so restless you fidgeted, paced or couldn't sit still (when the effects of marijuana were wearing off)?</li> <li>• Move or talk much more slowly than usual?</li> <li>• Find yourself sweating, your pupils dilating or your hair standing up (when the effects of marijuana were wearing off)?</li> <li>• Have unpleasant dreams that often seemed real?</li> <li>• See, feel or hear things that weren't really there (when the effects of marijuana were wearing off)?</li> <li>• Find yourself shaking?</li> <li>• Have trouble falling asleep or staying asleep (when the effects of marijuana were wearing off)?</li> <li>• Have fits or seizures?</li> <li>• Have very bad headaches (when the effects of marijuana were wearing off)?</li> </ul> <p>Use more marijuana to get over or avoid any of these bad aftereffects?</p>	<input type="checkbox"/>	<input type="checkbox"/>
Often use marijuana in larger amounts or for a much longer period than you meant to?	<input type="checkbox"/>	<input type="checkbox"/>

More than once want to stop or cut down on using marijuana?	<input type="checkbox"/>	<input type="checkbox"/>
More than once try to stop or cut down on using marijuana but found you couldn't do it?	<input type="checkbox"/>	<input type="checkbox"/>
Give up or cut down on activities that were important to you in order to use marijuana—like work, school, or associating with friends or relatives?	<input type="checkbox"/>	<input type="checkbox"/>
Give up or cut down on activities that you were interested in or that gave you pleasure in order to use marijuana?	<input type="checkbox"/>	<input type="checkbox"/>
Have a period when you spent a lot of time using marijuana or getting over its bad aftereffects?	<input type="checkbox"/>	<input type="checkbox"/>
Have a period when you spent a lot of time making sure you always had enough marijuana available?	<input type="checkbox"/>	<input type="checkbox"/>
Continue to use marijuana even though it was making you feel depressed, uninterested in things, or suspicious or distrustful of other people?	<input type="checkbox"/>	<input type="checkbox"/>
Continue to use marijuana even though you knew it was causing you a health problem or making a health problem worse?	<input type="checkbox"/>	<input type="checkbox"/>

## Appendix F

**Please mark the correct option for each question**

- Do you currently smoke marijuana? (choose one)
  - Yes, I currently smoke marijuana
  - No, I quit within the last 6 months
  - No, I quit more than 6 months ago
  - No, I have never smoked marijuana
  
- If yes to above: Are you seriously thinking of quitting smoking marijuana?  
(choose one)
  - Yes, within the next 30 days
  - Yes, within the next 6 months
  - No, not thinking of quitting
  
- If “Yes, within the next thirty days”: Have you tried quitting in the last year?  
(choose one)
  - Yes
  - No

## Appendix G

Below you will find some reasons why people choose to use marijuana or choose not to use marijuana. Please rate the importance of each of these items in your decision of whether or not to use marijuana, using a five-point scale:

- 1 = Not important  
 2 = A little bit important  
 3 = Somewhat important  
 4 = Quite important  
 5 = Extremely important

Note that you may or may not agree with a given statement, but please respond according to whether the statement is likely to influence your decision to use marijuana or not.

		1 Not Important			5 Extremely Important
1	It's illegal, and I could get caught.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	It's not accepted or approved of by people who are important to me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	I would feel happy when I'm high.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	It could impair my performance in my daily activities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	It could reduce my ability to pay attention or remember things.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	It would relieve stress, anxiety, or worry.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	It could make me feel bad physically (e.g., dry mouth, red eyes, racing heart).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	It could have unpleasant psychological effects (e.g., mood swings, depression, paranoia).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	It could create opportunities for social activities (e.g., meeting new people, bonding, or spending time with friends).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	It could contain other drugs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	It could impair my reaction time, vision, or perception.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Everyday activities would be more enjoyable (e.g., watching TV or movies, listening to music, playing video games).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	It could serve as a "gateway drug," leading to more dangerous drug use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	It could lead to dependency or addiction.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	It could make me feel "burnt out" or less energetic.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	It would make me more relaxed or calm.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	It could damage my current relationships.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	It could cause me to make the wrong type of friends.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	It would help me sleep.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	It could give me a bad image (e.g., labeled as a "pothead").	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23	It could impair my judgment, which may endanger myself or others.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24	It would make things funnier.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Appendix H

In the following questions, please make estimates about the marijuana use patterns of college students across the country using values between 0 and 100.

What percent of US college students use marijuana MORE than you?

\_\_\_%

What percent of US college students use marijuana LESS than you?

\_\_\_%

What percent of US college students DO NOT USE marijuana at all in a typical month?

\_\_\_%

What percent of US college students USED MARIJUANA IN THE LAST MONTH?

\_\_\_%

What percent of US college students USED MARIJUANA EVER IN THEIR LIFETIME?

\_\_\_%

## Appendix I

How much would your close friends approve if you...

	Disapprove	Don't care	Approve
Abstained from marijuana	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tried marijuana once or twice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Used marijuana occasionally	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Used marijuana regularly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



## Appendix J

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false as it relates to you personally.

		<b>True</b>	<b>False</b>
1	It is sometimes hard for me to go on with my work if I am not encouraged.	<input type="checkbox"/>	<input type="checkbox"/>
2	I sometimes feel resentful when I don't get my way.	<input type="checkbox"/>	<input type="checkbox"/>
3	On a few occasions, I have given up doing something because I thought I couldn't do it.	<input type="checkbox"/>	<input type="checkbox"/>
4	There have been times when I felt like rebelling against people in charge even though I knew they were right.	<input type="checkbox"/>	<input type="checkbox"/>
5	No matter whom I'm talking to, I'm always a good listener.	<input type="checkbox"/>	<input type="checkbox"/>
6	There have been times when I took advantage of someone.	<input type="checkbox"/>	<input type="checkbox"/>
7	I'm always willing to admit it when I make a mistake.	<input type="checkbox"/>	<input type="checkbox"/>
8	I sometimes try to get even, rather than forgive and forget.	<input type="checkbox"/>	<input type="checkbox"/>
9	I am always courteous, even to people who are disagreeable.	<input type="checkbox"/>	<input type="checkbox"/>
10	I have never been annoyed when people expressed ideas very different from my own.	<input type="checkbox"/>	<input type="checkbox"/>
11	There have been times when I was quite jealous of the good luck of others.	<input type="checkbox"/>	<input type="checkbox"/>
12	I am sometimes irritated by people who ask favors of me.	<input type="checkbox"/>	<input type="checkbox"/>
13	I have never deliberately said something that hurt someone's feelings.	<input type="checkbox"/>	<input type="checkbox"/>

## Appendix K

When you completed your initial questionnaires, were you redirected to another website to complete the online "e-TOKE" marijuana program? This program would have asked some additional questions about your marijuana use, and then provided some feedback to help you think about your use.

- NO, I just completed questionnaires  
 YES, I completed the e-TOKE intervention

If YES:

What did you like about the intervention? \_\_\_\_\_ (free text response) \_\_\_\_\_

What did you dislike about the intervention? \_\_\_\_\_ (free text response) \_\_\_\_\_

About how much time did the program take you (in minutes)? \_\_\_\_

How much attention did you give the program? (1=minimal, 3=some, 5=a lot)

We are interested in what components in particular were useful. Please rate the following components using a scale from 0 (not at all useful) to 4 (very useful).

		0			4
		Not at all			Very
		Useful			Useful
1	The feedback about how your use compares to that of other students.	0	1	2	3 4
2	The feedback about how much money you spend on marijuana, alcohol, and tobacco.	0	1	2	3 4
3	Thinking about other things that are important to you, and other ways to spend your time.	0	1	2	3 4
4	Considering ways to begin decreasing your marijuana use.	0	1	2	3 4
5	Campus resources (e.g., phone numbers to call).	0	1	2	3 4

Please rate your satisfaction with several aspects of the program using a scale from 0 (I strongly disagree) to 4 (I strongly agree).

		0			4
		I strongly			I strongly
		Disagree			Agree
1	This program was an appropriate length (not too time-consuming).	0	1	2	3 4
2	The program was easy to use.	0	1	2	3 4
3	It was useful that the program was available online.	0	1	2	3 4
4	I would recommend this program to my friends who use marijuana.	0	1	2	3 4

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out of high school into emerging adulthood: The effects of leaving home, going to college, and high school protective factors. *Journal of Studies on Alcohol*, 67, 810-822.

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## CURRICULUM VITAE

**Jennifer C. Elliott**

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**EDUCATION**

- Expected 8/2012      **PhD, Clinical Psychology**  
*Syracuse University, Syracuse NY*  
**Graduate Advisors:** Kate B Carey, PhD; Peter Vanable, PhD  
Dissertation Title: *Evaluation of a Web-based Intervention for College Marijuana Use* (Successfully defended 4/17/12)  
Dissertation Committee: Kate B Carey, PhD; Craig Ewart, PhD; Stephen Maisto, PhD; Aesoon Park, PhD; Robert Rubinstein, PhD; Peter Vanable, PhD  
Internship: Lehigh U. Counseling & Psychological Services Center
- 2008                      **MS, Clinical Psychology**  
*Syracuse University, Syracuse NY*  
Master's Thesis Title: *Developing a Decisional Balance Scale for Marijuana Use*  
Master's Thesis Committee: Kate B Carey, PhD; Stephen Maisto, PhD; Alecia Santuzzi, PhD; Peter Vanable, PhD
- 2005                      **BS, Psychology, Highest Honors**  
*Lehigh University, Bethlehem, PA*  
Concentration: Clinical; Science focus: Behavioral Neuroscience  
Undergraduate Honors Thesis: *Religious Coping, Functional Status, And Well-Being*
- 2004                      **BA, English, Highest Honors**  
*Lehigh University, Bethlehem PA*  
Undergraduate Honors Thesis: *Writing About Madness*

**FELLOWSHIPS, HONORS, AND AWARDS**

- 2007—2011              Conference Travel Funding – Syracuse U Psychology Department
- 2006—2012              Graduate Assistantship / Full Tuition Remission with Stipend
- 2009—2010              Eric F. Gardner Fellowship
- 2007—2009              Women in Science and Engineering Stipend
- 2008                      Research Society on Alcoholism Student Merit Meeting Award
- 2007                      Summer Fellowship – College of Arts & Sciences
- 2005                      Williams Writing and Performance Award – Senior Writing Prize
- 2004—2005              President's Scholarship (full year remitted tuition)
- 2004—2005              Phi Beta Kappa Honors Society
- 2002—2005              Psi Chi (Psychology) Honors Society
- 2001—2005              Roy Eckerdt College Scholar Program
- 2001—2005              Dean's Scholarship (\$10,000/yr tuition remission)

2002 Phi Eta Sigma (Freshman) Honors Society

### **PROFESSIONAL AFFILIATIONS**

2009—present Association for Psychological Science  
 2008—present American Psychological Association  
 2007—present Association for Behavioral and Cognitive Therapies  
 2009—2010 Society of Behavioral Medicine

### **RESEARCH EXPERIENCE**

- June 2010—present **Principal Investigator**  
*Dissertation: Evaluation of a Web-based Intervention for College Marijuana Use. Syracuse University.*  
Supervisor: Kate B Carey, PhD  
 Plan and conduct a randomized controlled trial evaluating a web-based intervention to reduce college marijuana use.
- Aug 2006—May 2011 **Lab member and/or research assistant**  
*Substance Use Risk Education (SURE) Project, Syracuse University*  
Supervisor: Kate B Carey, PhD  
 Data collection, data entry, and some statistical analyses for an intervention efficacy project. Participate in writing a literature review on the efficacy of e-Interventions for college drinking (Elliott et al., 2008). Effect size coding for meta-analyses on efficacy of e-interventions for college drinking (Carey et al., 2009) and the efficacies of varied alcohol interventions in college settings (Carey et al., under review). Collect data for a field study on fake ID use (Bolles et al., in progress).
- Nov 2008—April 2010 **Principal Investigator**  
*Qualifying Exam: Does family history of alcohol problems influence college use?: A meta-analytic review. Syracuse University.*  
Supervisor: Kate B Carey, PhD  
 Plan and conduct meta-analysis. Do content coding, effect size coding, analyses, and writing. Instruct a second coder on content and effect size coding. Reconcile discrepancies between coders.
- Jan 2007—Dec 2008 **Principal Investigator**  
*Masters Thesis: Developing a Decisional Balance Scale for Marijuana Use, Syracuse University*  
Supervisor: Kate B. Carey, PhD  
 Plan and conduct a four-phase scale development project. Conduct qualitative data collection, EFA/CFA, reliability and validity analyses.
- June 2007—Aug 2007 **Research Associate**  
*Ouimette Stress, Trauma and Response (O-STAR) Lab, Syracuse VA Medical Center, Syracuse, NY*  
Supervisor: Paige Ouimette, PhD  
 Create and edit research materials. Data entry.

- July 2005—June 2006 **Research Coordinator**  
*Adult Developmental Disorders Program, University of Pennsylvania Medical School, Philadelphia PA*  
Supervisors: J. Russell Ramsay, PhD; Tony Rostain, MD  
 Clinic scheduling and phone screens for ADHD and autism spectrum disorders. Neuropsychological assessment for clinical and research purposes. Data entry and organization. Aid in planning and organization of the first Penn Autism Network Conference.
- Sept 2004—May 2005 **Principal Investigator**  
*Undergraduate Honors Thesis: Religious Coping, Functional Status, And Well-Being, Lehigh University, Bethlehem PA*  
Supervisor: Timothy Lomauro, PhD  
 Plan and conduct a pilot study on religious coping and functioning in undergraduate students. Plan a study on religious coping in chronic pain patients (unable to collect data prior to graduation).
- Jan 2003—Dec 2003 **Undergraduate Research Assistant**  
*Cognition and language lab, Psychology Department, Lehigh University, Bethlehem PA*  
Supervisor: Pdraig O’Seaghdha, PhD  
 Consent and run participants on computerized tests of language perception and sentence organization. Measure soundwaves in a computer program and enter data. Attend conference with research team.

## **MANUSCRIPTS AND PUBLICATIONS**

- Bolles, J. R., **Elliott, J. C.**, & Carey, K. B. (2011). *Fake ID attitudes and behaviors in two samples*. Manuscript in preparation.
- Carey, K. B., Scott-Sheldon, L. A. J., **Elliott, J. C.**, Garey, L, Carey, M. P. (2011). *Face-to-face versus computer-delivered alcohol interventions for college drinkers: A meta-analytic review, 1998 to 2010*. Revising for resubmission.
- Gellis, L. A., Arigo, D. R., & **Elliott, J. C.** (2011). *Investigating a cognitive refocusing technique for insomnia: A randomized controlled trial in university students*. Revising for resubmission.
- Elliott, J. C.**, & Carey, K. B. (2011). *Changing Attitudes about Marijuana: A Preventive Intervention with College Abstainers*. Revising for resubmission.
- Elliott, J. C.**, & Carey, K. B. (2011). *Pros and Cons: Prospective Predictors of Marijuana Use on a College Campus*. Revising for resubmission.
- Elliott, J. C.**, Carey, K. B., & Bonafide, K. E. (2011). Does family history of alcohol problems influence college and university substance use?: A meta-analytic review. *Addiction*, in press.
- Elliott, J. C.**, Carey, K. B., & Scott-Sheldon, L. A. J. (2011). Development of a Decisional Balance Scale for young adult marijuana use. *Psychology of Addictive Behaviors*, 25, 90-100.



Carey, K. B., Scott-Sheldon, L. A. J., **Elliott, J. C.**, Bolles, J. R., & Carey, M. P. (2009). Computer-delivered interventions to reduce college student drinking: A meta-analysis. *Addiction*, *104*, 1807-1819.

**Elliott, J. C.**, Carey, K. B., & Bolles, J. R. (2008). Computer-based interventions for college drinking: A qualitative review. *Addictive Behaviors*, *33*, 994-1005.

## **PRESENTATIONS**

**Elliott, J. C.**, & Carey, K. B. (2012, November). Do they still get stoned? : Efficacy of a computerized marijuana intervention for undergraduates. Poster to be presented at the 46<sup>th</sup> annual meeting of the Association for Behavioral and Cognitive Therapies, National Harbor, MD.

Gellis, L. A., Arigo, D. R., & **Elliott, J. C.** (2012, November). Investigating a cognitive refocusing technique for insomnia: A randomized controlled trial in university students. Poster to be presented at the 46<sup>th</sup> annual meeting of the Association for Behavioral and Cognitive Therapies, National Harbor, MD.

**Elliott, J. C.**, & Carey, K. B. (2011, November). Reconsidering Beliefs about Marijuana: A Preventative Intervention with College Abstainers. Poster presented at the 45<sup>th</sup> annual meeting of the Association for Behavioral and Cognitive Therapies, Toronto, ON.

Scott-Sheldon, L. A. J., Carey, K. B., **Elliott, J. C.**, Garey, L., & Carey, M.P. (2011, October). Efficacy of Interventions to Reduce Alcohol Consumption and Alcohol-Related Problems among First-Year College Students: A Meta-Analysis, 1998 to 2010. Poster presented at the 5th Conference on Emerging Adults, Providence, RI.

Scott-Sheldon, L. A. J., Carey, K. B., Seigers, D. K., Garey, L., **Elliott, J. C.**, & Carey, M.P. (2011, April). Efficacy of Alcohol Expectancy Challenges to Reduce College Student Drinking: A Meta-Analysis. Poster session presented for the 32nd annual meeting of the Society of Behavioral Medicine, Washington, DC.

**Elliott, J. C.**, & Carey, K. B. (2010, November). A new look at an old question: A meta-analysis on the effect of family history on college drinking. Poster session presented at the 44<sup>th</sup> annual meeting of the Association for Behavioral and Cognitive Therapies, San Francisco, CA.

**Elliott, J. C.**, & Carey, K. B. (2009, November). *Putting the Marijuana Decisional Balance Scale to the test: Evidence for reliability, validity, and factor structure*. Poster session presented at the 43<sup>rd</sup> annual meeting of the Association for Behavioral and Cognitive Therapies, New York, NY.

Bolles, J. R., **Elliott, J. C.**, & Carey, K. B. (2009, November). *Understanding fake ID use: A study of fake ID prevalence, attitudes, and behaviors on a college campus*. Poster session presented at the 43<sup>rd</sup> annual meeting of the Association for Behavioral and Cognitive Therapies, New York, NY.

- Elliott, J. C. & Carey, K. B.** (2009, April). *Who's at risk?: The influence of family history on drinking patterns in a sample of mandated students*. Poster session presented at the 30<sup>th</sup> annual meeting of the Society of Behavioral Medicine, Montreal, QC.
- Elliott, J. C. & Carey, K. B.** (2009, April). *Why would I use marijuana?: A study of pros and cons reported by marijuana users and abstainers*. Poster session presented at the 30<sup>th</sup> annual meeting of the Society of Behavioral Medicine, Montreal, QC.
- Scott-Sheldon, L. A. J., **Elliott, J. C.**, Bolles, J. R., Carey, K. B., & Carey, M. P. (2009, April). *Meta-analysis of computer-delivered interventions to reduce college student drinking*. Poster session presented at the 30<sup>th</sup> annual meeting of the Society of Behavioral Medicine, Montreal, QC.
- Elliott, J. C.**, Bolles, J. R., & Carey, K. B. (2008, November). *"If anyone asks, my name is ...": A field study of fake ID use and opinions*. Poster session presented at the 42<sup>nd</sup> annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.
- Elliott, J. C.**, Bolles, J. R., Carey, K. B., & Scott-Sheldon, L. A. J. (2008, November). The efficacy of e-interventions for college drinking. In K. B. Carey (Chair), *Computer-based interventions for college drinking: Potential and pitfalls*. Symposium conducted at the 42<sup>nd</sup> annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.
- Elliott, J. C.**, & Carey, K. B. (2008, November). *Making decisions about marijuana use: A decisional balance study of marijuana use in college students*. Poster session presented at the 42<sup>nd</sup> annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.
- Elliott, J. C.**, Bolles, J. R., & Carey, K. B. (2008, July). *E-interventions for college drinkers: A qualitative review*. Poster session presented at the 31<sup>st</sup> annual meeting of the Research Society on Alcoholism, Washington, DC.
- Elliott, J. C.**, & Carey, K. B. (2008, July). *Harm prevention intentions: A link between therapist behavior and drinking outcome*. Poster session presented at the 31<sup>st</sup> annual meeting of the Research Society on Alcoholism, Washington, DC.
- Elliott, J. C.**, & Carey, K. B. (2007, November). *Nice therapists and satisfied clients: A mediation model*. Poster session presented at the 41<sup>st</sup> annual meeting of the Association for Behavioral and Cognitive Therapies, Philadelphia, PA.
- Elliott, J. C.**, & Lomauro, T. A. (2005, May). *Religious coping, functional status, and well-being*. Poster session presented at the annual meeting of the Lehigh Valley Association of Independent Colleges, Allentown, PA.

### **EDITORIAL EXPERIENCE**

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|-----------------|---------------------------------------|
| Ad hoc reviewer | Addictive Behaviors                   |
| Ad hoc reviewer | Addiction Science & Clinical Practice |

**RESEARCH TRAINING**

- May 2009                   **Statistics workshop**  
*Syracuse University*  
Three-day training in meta-analysis.
- May 2008                   **Statistics workshop**  
*Syracuse University*  
Three-day training in factor analysis and Item Response Theory.
- June 2007                   **Collaborative Institutional Training Initiative's online training for:  
1) Health Information Privacy & Security, and 2) Human Research.**  
Online training courses.
- August 2006               **National Institute of Health's Human Participant Protection  
Education for Research Teams**  
Online training course.

**GRANTS SUBMITTED**

- Dec 2008                   **East Asia and Pacific Summer Institutes for US Graduate Students**  
*National Science Foundation*  
Amount: \$5000, roundtrip airfare to Australia, and living expenses  
Result: Not funded

**TEACHING EXPERIENCE**

- November 2011           **Guest Co-Instructor – Sports Psychology**  
*Counseling Psychology Department, Lehigh University*  
Professors: Ian Birky, PhD; Eric Klein, PhD  
Participate in instruction on substance abuse.
- October 2011             **Guest Lecturer – Health Psychology**  
*Psychology Department, Lehigh University*  
Professor: Timothy Lomauro, PhD  
Lecture on college drinking and marijuana use.
- May 2011—June 2011   **Instructor – Introduction to Psychology**  
*Psychology Department, Syracuse University*  
Independently plan and teach the course.
- Aug 2010—May 2011   **Teaching Assistant – Statistics for Psychology**  
*Psychology Department, Syracuse University*  
Professor: Aesoon Park, PhD  
Teach four recitation sections for undergraduate statistics per semester.  
Review basic concepts. Instruct in using SPSS. Grade lab reports.  
Proctor exams.
- Aug 2008—April 2011   **Exam Proctor**  
*Psychology Department, Syracuse University*  
Assist in administration of midterm and final exams to undergraduates.

- Aug 2008—May 2010 **Grading Assistant – Personality**  
*Psychology Department, Syracuse University*  
Professor: Randall S Jorgensen, PhD  
 Serve as a consultant for and assist in grading of papers.
- Aug 2009—Dec 2009 **Teaching Assistant – Clinical Assessment (graduate level)**  
*Psychology Department, Syracuse University*  
Professor: Aesoon Park, PhD  
 Demonstrate clinical interview and WAIS-IV administration. Schedule, observe, and supervise students' administrations. Grade WAIS scoring. Lecture on Neuropsychological Assessment. Attend class. Office hours.
- Sept 2007—Dec 2008 **Graduate Student Mentor**  
*Psychology Department, Syracuse University*  
 Supervise three research assistants in data collection, data entry, and data cleaning, to assist in my masters thesis research.
- May 2008—June 2008 **Teaching Assistant – Personality**  
*Psychology Department, Syracuse University*  
Professor: Randall S Jorgensen, PhD  
 Attend class. Hold office hours and consult with students. Advise and grade students' papers. Lecture on Carl Rogers.
- April 2008 **Guest Lecturer - Alcohol Use and Abuse**  
*Psychology Department, Syracuse University*  
Professor: Kate B. Carey, PhD  
 Lecture on Cognitive Behavioral Therapy and substance use.
- Jan 2005—May 2005 **Apprentice Teacher – Abnormal Psychology**  
*Psychology Department, Lehigh University*  
Professor: Timothy Lomauro, PhD  
 Attend class and help as needed. Hold a study session. Proctor an exam. Give a lecture on Positive Psychology.

### INVITED TALKS

- May 2010, June 2011 **Graduate School in Psychology**  
*Clinical psychology class, Lehigh University (via Skype)*
- April 2010, April 2011 **Graduate School in Psychology**  
*Clinical psychology class, Syracuse University*
- November 2009 **Psychology Career Night Alumni Panel**  
*Lehigh University*

### TEACHING WORKSHOPS

- January 2008 **Teaching Assistantship training**  
*Syracuse University*  
 Two-day training, with lectures on teaching. Prepare and present a

brief lecture, with group video supervision.

## **CLINICAL EXPERIENCE**

- Aug 2011—present **Predoctoral Intern**  
*Lehigh University Counseling & Psychological Services Center*  
Supervisors: Ian Birky, PhD; Deborah Gardner, PhD; Laurie Gray Evans, PhD; Eric Klein, PhD; Aaron Sterba, MS  
 Individual psychotherapy with undergraduate and graduate students. Co-lead groups: mixed-gender undergraduate (year-long), substance abuse (year), men’s undergraduate (semester), and mindfulness (semester). Run campus outreach projects. Serve as primary supervisor for two graduate students. Walk-in crisis counseling.
- Aug 2010—May 2011 **Behavioral Health Consultant in Primary Care**  
*Syracuse University Health Services*  
Supervisors: Cheryl Flynn, MD; Jennifer Funderburk, PhD  
 Receive referrals from primary care. Provide brief interventions, ADHD screenings, and referrals. Address issues such as mood, anxiety, sleep, and substance abuse. Weekly group supervision with each supervisor.
- Aug 2008—May 2011 **Student Therapist**  
*Psychological Services Center, Syracuse University*  
Supervisors: Mark Ginsberg, PhD; Judith Gorovitz, PhD; Joseph Himmelsbach, PhD; Mary Jeannotte, PhD  
 Individual psychotherapy, intake sessions, and ADHD evaluations. Meet with supervisors weekly when sharing an active client. Staff meetings.
- Sept 2010—Mar 2011 **Sleep Interventionist**  
*Syracuse University Psychology Department*  
Supervisor: Les Gellis, PhD  
 Meet with undergraduates with insomnia. Review informed consent and administer surveys. Education on sleep hygiene and cognitive refocusing.
- Aug 2009—Aug 2010 **Neuropsychological Assessment**  
*Neuropsychology Assessment Program, SUNY Upstate Medical Center*  
Supervisors: Lyndsey Bauer, PhD; Dominic Carone, PhD, ABPP-CN; Quintin Poore, PhD  
 Observe clinical interviews and neuropsychological assessment with neurologically impaired patients by neuropsychologists. Assist in test administration. Participate in journal club and “fact finding” exercises (practice with interviewing/diagnosis).
- March 2008—May 2008 **Practicum Student Therapist**  
*Psychological Services Center, Syracuse University*  
Supervisor: Mark Ginsberg, PhD  
 Conduct individual therapy sessions and one intake evaluation.
- Dec 2007—May 2008 **Clinical Interviewer**  
*Quimette Stress, Trauma and Response (O-STAR) Lab, Syracuse VA Medical Center, Syracuse, NY*

Supervisor: Paige Ouimette, PhD  
Conduct biweekly phone interviews with individuals with PTSD and substance dependence.

- Aug 2007—May 2008 **Alcohol Interventionist**  
*Substance Use Risk Education (SURE) Project, Syracuse University*  
Supervisor: Kate B Carey, PhD  
Conduct Brief Motivational Interventions with mandated college students. Prepare personalized feedback forms. Review feedback forms with students, incorporating psychoeducation. Weekly supervision.
- July 2005—July 2006 **Neuropsychological Assessment**  
*Jefferson Hospital for Neuroscience, Philadelphia PA*  
Supervisors: David Glosser, ScD; Joseph Tracy, PhD  
Administer and score neuropsychological assessment measures with neurologically impaired clients, particularly epileptic surgical candidates in an inpatient unit, and epileptic outpatients following brain surgery. Observe 2-3 WADA procedures.
- Sept. 2005—May 2006 **Social Coach for young adults with autism spectrum disorders**  
*Social Skills Seminar, Adult Developmental Disorders Program, University of Pennsylvania Medical School, Philadelphia PA*  
Supervisor: Mary Cohen, PhD  
Work with two young adults with Asperger's Disorder. Observe the students in selected seminar classes. Encourage and facilitate social observation and interaction in activities outside the classroom.
- Sept 2004—June 2005 **Neuropsychological Assessment**  
*Private practice office, Allentown PA*  
Supervisor: David Glosser, ScD  
Administer and score neuropsychological assessment measures with neurologically impaired clients.

### CLINICAL WORKSHOPS

- December 2010 **Clinical Training workshop**  
*Syracuse University*  
Two day training addressing suicide assessment, the Mini-Mental Status Exam, anxiety treatment, and interpersonal psychotherapy.
- October 2010 **Rorschach workshop**  
*Syracuse University*  
Full-day training on the history of the Rorschach, and methods of scoring. Focus on Exner's Comprehensive System.
- January 2010 **Clinical Training workshop**  
*Syracuse University*  
Full-day training on domestic violence, CBT for insomnia, and conducting behavioral health interventions in primary care.
- August 2009 **Clinical Training workshop**

*Syracuse University*

Full-day training on integrated healthcare, suicide assessment, brief sleep interventions, and brief alcohol interventions.

Jan 2008—April 2008 **Cognitive Behavioral Therapy workshop***Syracuse University*

Two-hour weekly sessions on principles of CBT, CBT technique instruction and role-play, and case presentations.

July 2007—Aug 2007 **Clinical Interview Training***Ouimette Stress, Trauma and Response (O-STAR) Lab, Syracuse VA Medical Center, Syracuse, NY*

Receive training for administration of the Structured Clinical Interview for the DSM, the Clinician-Administered PTSD Scale, the Diagnostic Interview Schedule, and the Longitudinal Interval Follow-up Evaluation.

**SPECIFIC SKILLS**

Statistics software	STATA (proficient), SPSS (basic), SAS (basic)
Statistics techniques	Basic analyses, moderation & mediation analyses, exploratory factor analysis, confirmatory factor analysis, meta-analysis
Psyc/ Neuropsych Assessment	Experience administering and scoring tests of various abilities: IQ & general ability (WAIS, WASI, WISC, RBANS), dementia (Mattis DRS, Cross Cultural Cognitive Exam), academic skills (WRAT, WIAT), memory (WMS subtests, Biber, CVLT, HVL, CVMT, BVMT, TOMAL, Bueschke SRT), memory malingering (TOMM, Rey-16), verbal (BNT, NAART, BDAE Sentence Comp, MAE Sentence Rep, Boston Apraxia, Token Test), visuospatial (Visual Form Discrimination Test, Rey-O complex figure, clock drawing, line orientation, facial recognition, Graphic Pattern Generation, Beery VMI, Hooper VOT), executive functioning (D-KEFS subtests, WCST, Ruff Figural Fluency Test, Brixton Spatial Anticipation Test), attention (visual scanning, CPT, Brief Test of Attention, SDMT), motor function (grooved pegboard, Purdue pegboard, dynamometer, finger oscillation), social skill (IPT), and psychological/emotional symptomology (MMPI, NEO-PI, BDI, BAI, BHS, FSS, GDS, BADDS, CAARS, BRIEF)

**UNIVERSITY INVOLVEMENT**

2007—2009	Women in Science and Engineering: Future Professoriate Program
2002—2005	Phi Sigma Pi Co-ed Honors Fraternity

**SERVICE**

2006—2012	Psychology Action Committee Member, Syracuse University
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