8-1-2022

Latent Profiles of Young Adults Based on E-Cigarette Outcome Expectancies

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LATENT PROFILES OF YOUNG ADULTS BASED ON E-CIGARETTE OUTCOME EXPECTANCIES

A Dissertation

presented in partial fulfillment of requirements

for the degree of Doctor of Philosophy in Clinical Psychology

in the Department of Psychology

The University of Mississippi

by

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August 2022

ABSTRACT

Background: While cigarette smoking has steadily declined, electronic cigarette use (e.g., e-cigarettes, electronic nicotine delivery systems [ENDS]) has led a new generation to become addicted to nicotine (Cummings & Proctor, 2014; USDHHS, 2014). Some individuals believe these products have the potential to provide benefits in helping smokers quit; however, many harmful aspects have been uniquely associated with e-cigarette use (e.g., toxicity, vape-specific injuries, gateway effects, etc.). If e-cigarettes are to be established as useful cessation tools, researchers must better understand e-cigarette use beliefs and associated clinical targets.

Purpose: To better inform e-cigarette prevention and intervention, investigators developed profiles of young adults with similar e-cigarette outcome expectancies and used demographic features, transdiagnostic emotional variables (i.e., anhedonia, anxiety sensitivity, and distress tolerance), and smoking status to predict participants' group membership.

Participants and Methods: Five hundred and six young adults (aged 18 to 40) were recruited through Amazon Mechanical Turk to complete an anonymous survey created in Qualtrics. Nicotine users with varying nicotine use backgrounds were surveyed. The Youth E-Cigarette Outcome Expectancies Measure-Revised Long Version was used to assess participants' e-cigarette outcome expectancies (Pokhrel et al., 2014, 2018). Based on e-cigarette expectancies, subgroups were derived using latent class analysis in Mplus Version 8.4 (Muthén & Muthén, 1998-2017). After determining latent class profiles, demographic features and transdiagnostic

emotional variables, measured using the Snaith-Hamilton Pleasure Scale (Snaith et al., 1995), the Anxiety Sensitivity Inventory (Taylor et al., 2007), and the Distress Tolerance Scale (Simons & Gaher, 2005), were used to predict membership.

Results: Analyses revealed three distinct classes of participants with similar e-cigarette use expectancies. Sex, race, education, smoking status, anhedonia, and anxiety sensitivity significantly predicted membership. Heightened anxiety sensitivity was associated with increased odds of "Vape Positive" group membership.

Conclusions: Consistent with previous literature, identifying as female and being more educated appears to be connected to decreased positive e-cigarette expectancies. Anxiety sensitivity and anhedonia appear to be malleable clinical targets that predict young adults' positive beliefs about e-cigarette use. Findings support conclusions that differences exist between e-cigarette use and traditional smoking patterns. Additional research will elucidate understanding of diverse groups' e-cigarette use patterns.

DEDICATION

To my family, friends, and mentors, who made this work possible even in the midst of a very challenging time in the world, and helped to prove over and over the goodness of humanity.

ACKNOWLEDGEMENTS

I am deeply grateful to supportive mentors, teachers, statisticians, and scientists on whose shoulders I stand. I am especially grateful to my advisor, Dr. Lee Cohen, who has offered consistent encouragement and guidance throughout this project and along the path to my degree. Additionally, I offer sincere gratitude to my committee members, Dr. Laura J. Dixon, Dr. Annette Kluck, and Dr. Nicolaas Prins, for helping me to navigate this work. I am incredibly thankful for doctoral candidate, Mary E. Keenan, M.S., who generously shared her time and knowledge of difficult statistical concepts and who provided encouragement throughout this work. I would also like to thank Dr. Suzy Bird Gulliver who has provided constant support as I have navigated training as a scientist-practitioner. I offer sincere gratitude to my supervisors from UT Health Science Center San Antonio for their encouragement during the completion of this work. Finally, I am thankful for the unfailing support of my family and close friends.

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CHAPTER 1

INTRODUCTION

Across the globe, an estimated 7 million people die each year due to tobacco use and millions more suffer from severe, preventable, and chronic health conditions that are related to this use (U.S. Department of Health and Human Services [USDHHS], 2020; World Health Organization [WHO], 2017). In 2018, an estimated 34.2 million Americans reported smoking at least 100 cigarettes in their lifetime and now engage in daily use despite consistent, clear warnings dating back to the 1960's regarding the dangers of tobacco use (Creamer et al., 2019; USDHHS, 1964, 2020). With such widespread dissemination efforts and policies aimed at the eradication of tobacco use, it is not comprehensible why so many people continue to use products containing tobacco. Nevertheless, numerous factors have been associated with the resiliency of this health-compromising behavior despite the well-known health consequences.

While a comprehensive review of the many factors believed to contribute to tobacco use is beyond the scope of this introduction, there are two factors directly relevant to the proposed study. First, many individuals believe that smoking will lead to a number of benefits, including negative affect reduction, social facilitation, weight management, and craving reduction (Copeland et al., 1995). Second, nicotine is a highly addictive substance (Stolerman & Jarvis, 1995). In fact, studies have suggested that a person can become addicted to nicotine even after short-term cigarette use (Abrams et al., 2003; Abreu-Villaça et al., 2003; DiFranza et al., 2007).

Further, many people who wish to quit smoking must make multiple cessation attempts before ultimately succeeding (USDHHS, 2020).

In order to help lessen the impact of nicotine dependence, nicotine replacement therapies (NRT) such as nicotine gum and patches, were developed in the 1980's and became widely accessible in the 1990's (USDHHS, 2014). The widespread availability of the NTRs, in conjunction with a number of policy changes over the last 50 years, has led to a steady decline in cigarette smoking among adolescents and adults (Cummings & Proctor, 2014; USDHHS, 2014). However, in 2007, a new nicotine delivery device, electronic cigarettes (e-cigarettes, also known as electronic nicotine delivery systems [ENDS], vape pens), was introduced to the United States (American Lung Association [ALA], 2019; Zhu et al., 2013). Those who use these products are often referred to as "vapers" and the act of using e-cigarettes is called "vaping" (Merriam-Webster, n.d.). E-cigarettes are battery-powered smoking devices that create vapor using a metal element that heats an e-liquid. E-liquid comes in a variety of different flavors (e.g., menthol, tobacco, cherry, vanilla, etc.), and vapers can modify many aspects of their device, including nicotine dosage level, based on their personal preferences (Breland et al., 2017). While e-cigarettes do not contain tobacco, most contain nicotine, which comes from tobacco. As a result, the Food and Drug Administration (FDA) classifies them as "tobacco products" (American Cancer Society [ACS], 2020).

Since the introduction of e-cigarettes, they have been highly controversial. Proponents of e-cigarettes have welcomed these devices as potentially useful mechanisms, similar to NRT, for bolstering smoking cessation efforts among traditional, established cigarette smokers (Fairchild et al., 2014, 2019; Goniewicz et al., 2014; Notley et al., 2018; Siegel et al., 2011). In fact, recent findings suggest that e-cigarettes may be twice as effective as NRT at maintaining abstinence

from traditional cigarettes when these replacement therapies are combined with behavioral support (Hajek et al., 2019). E-cigarette proponents, therefore, emphasize a harm reduction approach, wherein health consequences are minimized rather than completely eliminated (Fairchild et al., 2014; Notley et al., 2018). These individuals tout decreased toxicity when compared to traditional cigarettes, and are hopeful that e-cigarettes may eventually lead to the elimination of traditional cigarettes from the marketplace altogether (Abrams, 2014; Nitzkin, 2014). However, this notion has been hotly debated given the wide range of nicotine delivery that has been documented within and across brands.

Other public health advocates have raised a multitude of concerns about the introduction of e-cigarettes into the marketplace (Bold et al., 2018; Buettner-Schmidt et al., 2016; Centers for Disease Control and Prevention [CDC], 2020; Chaffee et al., 2018; Cheng, 2014; Christiani, 2019; Dinardo & Rome, 2019; Doran et al., 2017; Irusa et al., 2020; Kooragayalu et al., 2020; Krishnan-Sarin et al., 2017; Palazzolo, 2013). While these devices are potentially less harmful than traditional cigarettes, they are not harmless (Nitzkin et al., 2014). Specifically, e-cigarette emissions contain toxic compounds (Adriaens et al., 2014; Fernández et al., 2015; Goniewicz et al., 2014; Hess et al., 2017) and misperceptions are common among young e-cigarette users regarding the harmful and addictive nature of these products (Abrams et al., 2018; Brown et al., 2014; Kristina et al., 2019; Leventhal et al., 2015; Suftin et al., 2015). In fact, young e-cigarette users have reported altering their e-cigarettes to further intensify their experience (e.g., produce thicker vapor clouds, enhance flavor, and produce a stronger "throat hit") by dripping e-liquid onto heat atomizers within their devices. This action also increases the level of toxicity in the substance being inhaled (Dinardo & Rome, 2019; Krishnan-Sarin et al., 2017).

Further, while some believe that e-cigarette risk factors are less severe in comparison to traditional cigarette outcomes (Britton et al., 2016), e-cigarette use by adolescents is linked to a broad range of maladaptive developmental outcomes, including poor academic performance, adverse learning outcomes, decreased sleep quality, increased aggressive and impulsive behavior, attention deficits, impaired memory, increased depression and suicidal ideation (Smith et al., 2015; Tobore, 2019). Finally, "gateway effects" and a lack of accurate data on the product labels are other noteworthy concerns. That is, young e-cigarette users tend to transition to using traditional cigarettes after initiating the use of e-cigarettes (Bold et al., 2018; Chaffee et al., 2018; Doran et al., 2017; Hajek et al., 2019; Tobore, 2019) and the labels on e-cigarettes commonly display inaccurate nicotine dosage levels (Buettner-Schmidt et al., 2016; Cheng, 2014).

Over the past several years, health advocates have examined why e-cigarettes are so appealing to youth. A 2016 survey of middle and high school students revealed three leading reasons for e-cigarette use among this group: 1) modeling by friends or family, 2) availability of an appealing variety of flavors such as mint, candy, fruit, and chocolate, and 3) beliefs that e-cigarettes are less harmful than traditional cigarettes (Jamal et al., 2017). Considering these findings, it is not surprising that just seven years after the introduction of e-cigarettes to the public, e-cigarette use exceeded traditional cigarette use among young adults (ALA, 2019; USDHHS, 2016). In fact, between 2017 and 2018, a sharp increase in the prevalence of e-cigarette use was observed among college students (6.1% to 15.5%) and young adults (6.5% to 10.6%; Schulenberg et al., 2019). Sadly, psychosocial predictive modeling has demonstrated that many of these individuals would have been unlikely to begin using a tobacco product if e-cigarettes had not entered the marketplace (Dutra & Glantz, 2017). Specifically, while cigarette

smoking has steadily been declining, e-cigarette use has steadily been on the rise, and the risk profiles for cigarette and e-cigarette users differ. These findings indicate that youth who normally would not have been categorized as "at risk" for cigarette smoking are presently considered "at risk" for using e-cigarettes, and ultimately, progressing to traditional cigarette smoking (Dutra & Glantz, 2017).

While the debate continues among public health advocates, the current status of the research in the field clearly indicates that e-cigarettes are not a healthy substitute for cigarette smoking. One reason for this (and as mentioned above) is that investigators have consistently found many toxic substances (e.g., acrolein, formaldehyde, propylene glycol) present in e-cigarette vapor (Chaumont et al., 2019; Chun et al., 2017; England et al., 2015; Lødrup Carlsen et al., 2018; National Academies of Sciences Engineering Medicine, 2018; Sherwood & Boitano, 2016; Wang et al., 2019). Furthermore, in addition to the known risks linked to nicotine use (e.g., respiratory and cardiovascular disease; Dwyer et al., 2009; Gibson et al., 2018; Lerner et al., 2015; Lippi et al., 2014; Wu et al., 2014), recent studies have revealed a number of health risks associated explicitly with e-cigarette use, including inhalation of harmful aerosols and flavorings (e.g., butter, cinnamon; Gibson et al., 2018; Glasser et al., 2017; USDHHS, 2016), vaping specific lung injuries (Christiani, 2019), and exploding batteries (Gibson et al., 2018; Glasser et al., 2017; USDHHS, 2016). Health authorities have also demonstrated that smokers and e-cigarette users are at elevated risk for contracting various illnesses (e.g., the novel coronavirus 2019 [COVID-19], the Middle East respiratory syndrome coronavirus [MERS-CoV]) when compared with their non-smoking peers (Guan et al., 2020; Seys et al., 2018). Finally, compared to non-e-cigarette users, e-cigarette users are at twice the risk of experiencing myocardial infarction and are at a higher risk for developing cancer (Alzahrani et al., 2018).

Given the various health risks associated with e-cigarette use, these devices are clearly unacceptable long-term solutions to the tobacco epidemic. Accordingly, we must work expeditiously to prevent ongoing suffering and preventable death in our society. To work toward this aim, the present investigation seeks to expand the current knowledge-base by gaining insight into cognitive processes underlying e-cigarette use. By assessing differences in e-cigarette users' beliefs about vaping, this study also seeks to be a first step in assisting with the development of more targeted approaches to the prevention and intervention of e-cigarette use. Further, the current study will assess differences between subgroups based on demographic and emotion-related variables.

Due to the increasing prevalence of e-cigarette use and its associated health risks, we must gain a better understanding of the influences affecting use patterns. It is no longer sufficient to take existing treatment protocols for cigarettes and adapt them for e-cigarette users given that we know that more individualized treatments have better outcomes (Gibson et al., 2018). However, considering that the literature in this area is relatively new, much can be gleaned from the research base examining cigarette smokers. Two broad areas that have been extensively studied among cigarette smokers are factors related to expectancies and affect. The present study will examine these two areas as a foundation to gain a better understanding of e-cigarette use. The reason for this is that drug outcome expectancies have been linked to use patterns across a wide variety of substance use groups (e.g., Fromme et al., 1993, 1997; Goldman et al., 1987; Katz et al., 2000) and emotional features (i.e., anhedonia, anxiety sensitivity, and distress tolerance) have been implicated in the etiology and maintenance of comorbid psychopathology and cigarette smoking (Leventhal & Zvolensky, 2015). In the next section, I will review the literature on smoking outcome expectancies. This section will be followed by a

discussion of the transdiagnostic vulnerability framework for emotion-smoking comorbidity, and what is currently known about its relationship with e-cigarette use.

Smoking Outcome Expectancies

Simply put, smoking outcome expectancies are the anticipated consequences of smoking (Cohen et al., 2002; Copeland et al., 1995). This construct has been extensively studied (e.g., Copeland et al., 1995; Gregor et al., 2008; Gwaltney et al., 2005; Johnson et al., 2008; Urbán, 2010; Zvolensky et al., 2004) and associations between smoking outcome expectancies and the likelihood of smoking initiation (Brandon et al., 1999), level of nicotine dependence (Brandon & Baker, 1991), urge to smoke (Brandon et al., 1996; Palfai, 2002), and the likelihood of success in cessation attempts (Wetter et al., 1994) have been documented. This knowledge has led to a better understanding of why individuals continue to smoke despite the well-known health consequences and has been helpful in developing more effective prevention and treatment programs (Copeland et al., 1995; Murphy et al., 2018; Rohsenow et al., 2003).

Broadly, expectancies can be categorized as either positive or negative. While positive smoking outcome expectancies highlight appealing aspects of smoking a cigarette (e.g., social facilitation, taste, negative affect reduction, etc.), negative smoking outcome expectancies highlight adverse outcomes (e.g., health risks, negative social outcomes, etc.). Positive smoking expectancies, which tend to be more immediate, have greater predictive power than negative smoking expectancies regarding the consumption of cigarettes and smokeless tobacco (Brandon et al., 1999; Branstetter et al., 2015; Stacy et al., 1990). Similar to cigarette smoking, positive e-cigarette outcome expectancy scores have been associated with e-cigarette dependence (Pokhrel et al., 2018). E-cigarette expectancies have also been associated with cessation propensity among dual-users (Brandon et al., 2019).

Some investigators have categorized expectancies more specifically (e.g., negative consequences, sensory satisfaction, negative reinforcement, appetite weight/control), taking factors such as social facilitation and taste into account (Copeland et al., 1995). Others have even found associations between smokers' outcome expectancies and level of sensitivity to anxiety (Johnson et al., 2008). Further, differences across various groups' smoking expectancies have also been documented (Aguirre et al., 2016; Pang et al., 2015; Piñeiro et al., 2016). For example, women tend to endorse elevated negative reinforcement and weight control expectancies more strongly than men. Additionally, Hispanic smokers report more negative reinforcement expectancies when compared to Black or Caucasian smokers (Aguirre et al., 2016; Pang et al., 2015).

Among e-cigarette users, research on outcome expectancies is preliminary at best as investigators continue to develop instruments to more accurately capture the experiences of those who vape. Researchers have taken two main approaches to create e-cigarette outcome expectancy measures: 1) the adaptation of pre-existing smoking measures or 2) the creation of new measures via factor analysis. Taking the first approach and adapting language from traditional cigarette measures, investigators have been able to capture e-cigarette expectancies that overlap with traditional smoking expectancies (Copeland et al., 1995; Copeland & Brandon, 2000; Harrell et al., 2014, 2015; Morean & L'Insalata, 2017). However, while some findings from the emerging e-cigarette expectancy literature mimic what has been found in the smoking expectancy literature, some notable differences have also been documented highlighting the need for a measure designed specifically for this product (Gibson et al., 2018; Harrell et al., 2014; Pokhrel et al., 2014; Soule et al., 2017).

Notably, in the cigarette smoking literature, a large body of work has centered on negative affect reduction/emotion regulation and tobacco use. Many cigarette smokers report the belief that smoking a cigarette will help them cope better when experiencing negative affect. In fact, the idea of a "feedback loop" is often discussed where individuals begin smoking to reduce negative affect and continue to smoke to ameliorate withdrawal symptoms (Garey et al., 2020). Over time, the strength of this association increases, leading to higher levels of nicotine dependence. Similar to what is reported by individuals who smoke, e-cigarette users have reported expectations that e-cigarettes will help them manage their mood (e.g., reduce anger, feel calm, provide stress relief; Pokhrel et al., 2014). In fact, stress relief was noted as a primary e-cigarette outcome expectancy that led to e-cigarette initiation among college students (Tamulevicius et al., 2020).

While many categories of cigarette and e-cigarette outcome expectancies are similar (e.g., negative consequences, positive reinforcement/sensory satisfaction, negative reinforcement/negative affect reduction, appetite/weight control, etc.), the experience of using cigarettes differs from the experience of using e-cigarettes (Brandon & Baker, 1991; Gibson et al., 2018; Harrell et al., 2014, 2019). For example, current daily cigarette smokers report the perception that e-cigarettes are more satisfying, are less harmful, cause less craving, lead to less severe withdrawal symptoms, are less likely to lead to dependence, cause less negative physical feelings, and taste better than traditional cigarettes. Conversely, traditional cigarettes are perceived by current daily smokers as better for negative affect reduction, weight control, stimulation, and stress reduction (Harrell et al., 2014). Further, many e-cigarette users enjoy social facilitation aspects (e.g., personalizing devices, supporting local e-cigarette shops, using nicotine in a broader variety of environments, encountering less stigma, learning vaping tricks;

Brown & Cheng, 2014; Gibson et al., 2018; Harrell et al., 2019; Soule et al., 2017; USDHHS, 2016; Vu et al., 2018) that are specific to their product and differ from traditional cigarette use.

For this reason, some investigators have cautioned their colleagues about simply substituting "e-cigarette" for "cigarette" in existing measures and have taken it upon themselves to create new measures of e-cigarette outcome expectancies (Copeland et al., 2017; Gibson et al., 2018; Harrell et al., 2019; Morean et al., 2019; Pokhrel et al., 2014, 2018; Soule et al., 2017). For example, Pokhrel and colleagues (2014) systematically studied e-cigarette use outcome expectancies among college students who reported current or past use of cigarettes or e-cigarettes, as well as individuals who reported that they never used either product. As a result of this work, these investigators developed long and short versions of an e-cigarette outcome expectancies measure, which has recently been revised (Pokhrel et al., 2018). This group is presently preparing the long version's psychometric data for publication (P. Pokhrel, personal communication, April 16, 2020).

Similar to the findings in the smoking outcome expectancy literature, demographic features such as age (Choi & Forster, 2013; Pearson et al., 2012; Regan et al., 2013), sex (Choi & Forster, 2013; Littlefield et al., 2015; Piñeiro et al., 2016), education level (Glover et al., 2018), and race/ethnicity (Suftin et al., 2013), have been linked to e-cigarette use and e-cigarette outcome expectancies. These demographic associations are essential as they provide information to researchers and clinicians with regard to a person's unique behavioral patterns. Specifically, regarding age and e-cigarette use, it appears that younger individuals are more likely to use e-cigarettes when compared to older individuals (Pearson et al., 2012; Regan et al., 2013). When adults over the age of 25 use e-cigarettes, they endorse their use as related to cessation more so than emerging adults (aged 18-24), who appear to initiate due to curiosity and interest in the

flavors available (Boyle et al., 2019). Additionally, several investigators have found that male gender is more highly associated with e-cigarette use (Littlefield et al., 2015). Males also tend to use e-cigarettes for positive reinforcement and endorse more positive e-cigarette expectancies (e.g., taste, social facilitation, increased energy), whereas females report using e-cigarettes for negative affect reduction and weight control (Piñeiro et al., 2016). Interestingly, females have reported a preference for sweet e-cigarette liquid flavors and brands that resemble traditional cigarettes (Dawkins et al., 2013). Considering level of education and e-cigarette use, college graduates are less likely to currently use or try e-cigarettes in comparison to those with less education (e.g., technical school, high school, or fewer years of education), but it appears that when they use e-cigarettes, they also concurrently smoke cigarettes (Boyle et al., 2019; Nayak et al., 2016). In fact, as education level increases, so too do positive expectancies (e.g., craving and negative affect/stress reduction, weight control, social facilitation, stimulation, taste, satisfaction, convenience) towards e-cigarettes (Zvolensky et al., 2018).

The association between e-cigarette use and race/ethnicity is also worthy of continued investigation as inconsistent results have been reported (Littlefield et al., 2015; Pearson et al., 2012; Regan et al., 2013; Suftin et al., 2013). While Suftin et al. (2013) reported that minority (Hispanic and "other race") college students were more likely to report ever using e-cigarettes when compared to their non-Hispanic White counterparts, others have failed to replicate this finding (Choi & Forster, 2013; Littlefield et al., 2015; Pearson et al., 2012; Regan et al., 2013). Investigators speculate that differing racial/ethnic composition of samples (e.g., 18% Latino/Hispanic in Littlefield et al., 2015 vs. 3% Hispanic in Suftin et al., 2013) may be the cause for these seemingly discrepant race/ethnicity findings.

In addition to these demographic associations, e-cigarette outcome expectancies have also been linked with psychological distress (Miller et al., 2017; Prochaska et al., 2012). For example, higher positive e-cigarette outcome expectancies (e.g., weight control, social effects) have been endorsed by cigarette smokers with severe psychological distress (SPD) when compared to their counterparts reporting lower levels of psychological distress. This finding has led researchers to suspect that cigarette smokers with SPD are more likely than those without SPD to engage in dual use of these products (Miller et al., 2017). This association is particularly noteworthy as a large body of literature has demonstrated the high prevalence of cigarette smoking among those diagnosed with psychiatric disorders (Brown et al., 1996; Dickerson et al., 2013; Lasser et al., 2000; Talati et al., 2013). If these heavier smokers progress to dual use, the chasm between those with mental health concerns and those without will continue to widen (Cummins et al., 2014). To better understand the aspects that contribute to the disproportionate use among clinical groups, Leventhal and Zvolensky (2015) reviewed the smoking literature concerning the relationship between emotional psychopathology and smoking. To illustrate this relationship, investigators presented a transdiagnostic vulnerability framework involving three emotional features or "phenotypes" (also referred to as vulnerabilities), and include anhedonia, anxiety sensitivity, and distress tolerance.

Given that smoking enhances pleasure/positive affect (Strong et al., 2011), reduces anxiety (Kassel & Unrod, 2000), and dampens distress (Kassel et al., 2003), it makes sense that deficits in these areas may lead some individuals to be more reinforced by smoking than others (Leventhal & Zvolensky, 2015). Specifically, anhedonia, anxiety sensitivity, and distress tolerance have been linked to cigarette smoking among individuals with comorbid emotional psychopathology and have been theorized as vulnerable aspects of their presentation that may

leave them more susceptible to this type of comorbidity. Initial studies of these phenotypes have also been conducted among e-cigarette users (Leventhal et al., 2016; Versella et al., 2019; Zvolensky et al., 2018, 2019a, 2019b, 2019c). These constructs have been shown to be important in both the cigarette and e-cigarette literature. For instance, the relationship between smoking and emotion (Baker et al., 2004), as well as vaping and emotion (Versella et al., 2019), are thought to be bidirectional as use of either product may also exacerbate mental health issues.

While the emerging body of literature examining e-cigarette use and psychopathology has been mixed, preliminary work suggests that the same three phenotypes observed among smokers may also be tied to e-cigarette outcomes (Garey et al., 2020; Zvolensky et al., 2019b). However, more work is needed to clarify these associations as patterns appear to diverge from traditional cigarette use patterns (Gibson et al., 2018; Harrell et al., 2019; Leventhal et al., 2016; Pokhrel et al., 2015; Versella et al., 2019). Prior to outlining more recent e-cigarette findings, further discussion on the connection between emotional psychopathology and traditional cigarette smoking is warranted.

Transdiagnostic Vulnerability Framework for Emotion-Smoking Comorbidity

The transdiagnostic vulnerability framework is a theory driven model used to illustrate trajectories of emotion-smoking comorbidity and to improve the understanding of shared etiology across a variety of diagnostic categories (Leventhal & Zvolensky, 2015). Researchers have found that transdiagnostic phenotypes augment smoking's rewarding properties; thereby, propelling some smokers through their nicotine use trajectory more efficiently than others (Leventhal & Zvolensky, 2015). Specifically, due to smoking's known rewarding properties, including the ability to increase pleasure/positive affect (Strong et al., 2011) and reduce anxiety and distress (Kassel et al., 2003; Kassel & Unrod, 2000), people with associated negative affect (i.e., anhedonia, anxiety sensitivity, and distress intolerance), find smoking to be more

reinforcing. Further, this relationship appears to impact each stage of their smoking trajectory (e.g., initiation, maintenance, progression), making cessation more difficult. Further, these transdiagnostic vulnerabilities have been studied across a wide variety of mental health diagnoses (e.g., dysthymia, depression, GAD, social anxiety, OCD, specific phobia, panic disorder, PTSD; Leventhal & Zvolensky, 2015).

For a more comprehensive review of the literature on these mechanisms among cigarette smokers, please see Leventhal & Zvolensky (2015). For the purpose of the present study, a summary of these constructs and their relationship to smoking and a smokers' use trajectory will be provided before examining what is known about their relation to e-cigarettes and e-cigarette outcome expectancies.

Anhedonia

Anhedonia has been defined as, "a decrease in the capacity to experience pleasure from previously pleasurable activities" (Ho & Sommers, 2013, p. 3). It is most widely referred to as a symptom of depression; however, anhedonia is also notably elevated among individuals with other mental health problems (American Psychiatric Association [APA], 2013; e.g., psychosis, Cohen et al., 2011; borderline personality disorder, Bandelow et al., 2010; Marissen et al., 2012; social anxiety disorder, Watson & Naragon-Gainey, 2010; ADHD, Meinzer et al., 2012; PTSD, Kashdan et al., 2006, and OCD, Abramovitch et al., 2014; Leventhal & Zvolenksy, 2015). When a person smokes a cigarette, the pleasure/reward brain pathways in the brain (e.g., mesolimbic DA neurones from nucleus accumbens to VTA) are stimulated (Balfour, 2009). In turn, smokers are able to experience increased pleasure from the rewarding stimuli (Leventhal & Zvolensky, 2015).

Anhedonia has been associated with initiation starting in early adolescence (Stone et al., 2017). Specifically, adolescents who endorse higher levels of anhedonia also have higher scores on measures of smoking initiation susceptibility. Unfortunately, after smoking habitually, the price of this increased pleasure is an alteration in the same brain pathways (Lin et al., 2015). These alterations cause these individuals to return to their baseline level of lower pleasure, making abstinence from smoking even more aversive (Leventhal & Zvolensky, 2015). This altered threshold leads cigarette smokers to continue smoking and progress to more frequent use in order to promote increased pleasure once again (Leventhal & Zvolensky, 2015; Watkins et al., 2000).

Anxiety Sensitivity

Anxiety sensitivity has been defined as the fear of the symptoms of anxiety, which stems from the belief that there are harmful consequences to these symptoms (Reiss et al., 1986, 1991). These symptoms include psychological, physical, and social concerns (Taylor et al., 2007). Researchers have extensively studied anxiety sensitivity among patients with a variety of mental health diagnoses (e.g., panic disorder, Li & Zinbarg, 2007; McNally, 2002; PTSD, Fedoroff et al., 2000; Marshall et al., 2010; generalized anxiety, depression, Allan et al., 2014; Taylor et al., 1996; social anxiety disorder, Nowakowski et al., 2016; Scott et al., 2000). Overall, anxiety sensitivity appears to augment the appeal for smoking among those who are more susceptible to the anxiolytic effects of nicotine. As such, smoking is a negatively reinforced behavior that represents a "quick fix" for anxiety (Leventhal & Zvolensky, 2015). However, over time, smoking increases the physical symptoms related to anxiety leaving chronic smokers with this maladaptive coping mechanism and, ultimately, making cessation even more difficult. Thus, those high in anxiety sensitivity become dependent on the relaxing/stress-reducing aspects of

use, leaving them unprepared to face anxiety without their maladaptive coping skill—smoking (CDC, 2010; Leventhal & Zvolensky, 2015).

Distress Tolerance

Distress tolerance is defined as the, "perceived or actual ability to tolerate emotional and physical distress" (Leventhal & Zvolensky, 2015, p. 4; Zvolensky et al., 2010). Five domain-specific dimensions, including tolerance of uncertainty, tolerance of ambiguity, tolerance of frustration, tolerance of negative emotion, and tolerance of physical discomfort, make up this construct (Leyro, Zvolensky, & Bernstein, 2010). These domains have been linked to generalized anxiety disorder (GAD), depression, problems related to procrastination, self-harm, symptoms of post-traumatic stress disorder, and the substance use disorders (Zvolensky et al., 2010). People who exhibit less tolerance for distress may be more likely to initiate smoking as a way of coping to their distress (Leventhal & Zvolensky, 2015; Schlam et al., 2020). Researchers have also documented a pattern of increased cessation difficulty for those lower in distress tolerance (Abrantes et al., 2008; Brandon et al., 2003; Brown et al., 2002, 2005; Schlam et al., 2020).

In sum, higher levels of anhedonia, a greater sensitivity to the symptoms of anxiety, and lower levels of distress tolerance cause some individuals to have a greater likelihood of enduring comorbid psychopathology and nicotine addiction. Specifically, emotion-smoking comorbidity is thought to occur due to bidirectional relationship between psychopathology and smoking, wherein those with emotional difficulties are more susceptible to the reinforcing properties of smoking and smoking exacerbates emotional difficulties. These phenotypes represent useful, malleable targets for cigarette smoking prevention and intervention (Leventhal & Zvolensky, 2015). Accordingly, researchers have begun to investigate how these phenotypes influence e-

cigarette use patterns and associated mental health issues (e.g., Chou et al., 2017; Leventhal et al., 2016; Versella et al., 2019; Wills et al., 2015). Among adolescents, dual users represent the most "at risk" group for difficulties with behavioral and emotional self-control (Wills et al., 2015). Further, distinct patterns of psychological symptoms have been found across adolescent lifetime traditional cigarette smokers, e-cigarette users, dual-users, and never users (Leventhal et al., 2016). Specifically, adolescent cigarette smokers and dual-users report more severe internalizing emotional syndromes (e.g., depression, generalized anxiety, panic, obsessive compulsive disorder [OCD]) and more difficulty tolerating distress when compared to adolescent e-cigarette only users and never users. Further, adolescent e-cigarette only users report similar levels of anhedonia to their cigarette smoking and dual using peers. In comparison to never users, adolescent e-cigarette only users exhibit more intense symptoms associated with major depression and panic disorder (Leventhal et al., 2016).

Interestingly, very few studies have assessed these patterns among adults. In fact, the first study to assess psychopathology and transdiagnostic emotional vulnerabilities among adult (aged 18 – 44 years) dual-users, e-cigarette users with a history of cigarette smoking, and never smoking e-cigarette users was published recently (Versella et al., 2019). This study suggests that pivotal differences across developmental cohorts may exist. Remarkably, in comparison to adult e-cigarette only users, adult dual users exhibited lower levels of anxiety and stress, and less difficulty with emotion regulation. Further, e-cigarette users without a history of cigarette use reported more severe anxiety, stress, and emotion regulation difficulties compared to dual users or e-cigarette users with a history of cigarette use. No significant differences between these groups were found in terms of distress tolerance or anxiety sensitivity (Versella et al., 2019). In sum, this recent study found that adult e-cigarette use patterns and internalizing psychopathology

appear to differ from those observed among adult cigarette smoking and adolescent e-cigarette use.

Given this connection between difficulties with emotion regulation and nicotine use, it is not surprising that associations between the anxiety disorders, past 12-month e-cigarette use, and lifetime e-cigarette use have been found in a nationally representative sample of adults even after controlling for sociodemographic variables (Chou et al., 2017; Garey et al., 2020). What is surprising is that the association between panic disorder and lifetime e-cigarette use was the only association among the anxiety disorders after controlling for psychiatric comorbidities (Chou et al., 2017; Garey et al., 2020). Researchers speculate that this may be due to differences in the pharmacological profiles of cigarettes versus e-cigarettes (Versella et al., 2019). Specifically, cigarettes appear to deliver nicotine more efficiently when compared to e-cigarettes. Further, these differences in nicotine administration may lead to changes in resulting withdrawal symptoms and anxiolytic effects (Versella et al., 2019).

Currently, few studies have assessed the relationship between adult e-cigarette outcome expectancies and transdiagnostic phenotypes. However, initial work suggests that these processes differ from what has been found in the literature examining cigarette smokers. For example, a negative correlation between anhedonia and positive and negative e-cigarette outcome expectancies was reported among adult (M_{age}=35.27 years, SD=10.22) e-cigarette and dual users (Garey et al., 2019). It appears that this study is the first to assess this relationship. Thus, further work is needed to better clarify the belief patterns regarding e-cigarette use among those reporting high levels of anhedonia.

To date, more work has centered on the relationship between adult anxiety sensitivity and e-cigarette outcome expectancies than any other transdiagnostic phenotype. Among adult past

month e-cigarette users, greater worry was associated with more anxiety sensitivity, which was ultimately associated with higher positive e-cigarette outcome expectancy scores. However, it is important to note that this pathway represented a small effect size (ES=0.11, 95% CI=.075, 0.161; Zvolensky et al., 2018). Further, e-cigarette users who reported high levels of anxiety sensitivity and also report high positive outcome expectancies for e-cigarette use tend to report more perceived e-cigarette benefits, risks, and a greater number of failed e-cigarette quit attempts compared to those who exhibit the opposite pattern (Zvolensky et al., 2019a). Anxiety sensitivity also appears to moderate the relationship between fatigue severity and positive e-cigarette outcome expectancies; however, this relationship was not apparent for negative e-cigarette outcome expectancies (Manning et al., 2019). Finally, regarding distress tolerance, one peer-reviewed published article on this topic exists. While the association between distress tolerance and e-cigarette outcome expectancies did not reach significance, results trended in the expected direction based on previous traditional cigarette literature (Brockenberry et al., 2020).

Overall, in order to tailor e-cigarette prevention, reduction, and cessation efforts, we must better understand the variability present in adults' e-cigarette outcome expectancies as a function of demographic features and emotional vulnerabilities. While distinctions between subgroups are relevant, patterns can be challenging to parse apart and meaningfully apply in clinical settings. For this reason, many investigators have utilized latent variable mixture models (LVMM; e.g., latent profile analysis [LPA], latent class analysis [LCA]) to create homogenous profiles of individuals within a larger heterogeneous population (Oberski, 2016). Given the nascence of the e-cigarette literature, a broad-level empirical approach to identifying these patterns is imperative as a foundation for future work as researchers and clinicians alike may benefit from improved clarity on distinct differences in e-cigarette users' beliefs.

Latent Variable Mixture Models (LVMM)

Using theory-driven hypotheses, researchers have empirically derived unique subgroups and probabilistically assigned individuals to these groups based on their specific responses via a latent variable mixture modeling approach. After creating subgroups of users, researchers are able to make determinations about how these different subgroups and individuals vary based on data (Tein et al., 2013). Distinct profiles allow investigators and clinicians to better understand how individuals fit into existing theoretical models and in turn, prevention and cessation programs can be customized based on this data to increase effectiveness.

Previously, classes of adolescent (Cole et al., 2019; Delk et al., 2019; Gilreath et al., 2016; Golinelli et al., 2019; Guo et al., 2009; Harrell et al., 2017; Huh & Leventhal, 2016; Miech et al., 2016; Morean et al., 2016; Nasim et al., 2012; Rose et al., 2012; Scheier & Komarc, 2020; Simon et al., 2017; Timberlake et al., 2008) and adult (Boyle et al., 2019; Chen et al., 2004; Cooke et al., 2016; Deiches et al., 2013; Erickson et al., 2014; Furberg et al., 2005; Ganz et al., 2019; Haardörfer et al., 2015; Harrell et al., 2013; Kristman-Valente et al., 2016; Kypriotakis et al., 2018; Lanza, Motlagh, & Orozco, 2020; Laska et al., 2009; Lee et al., 2019; Lisha et al., 2019; Manley et al., 2009; McCarthy et al., 2015; Mistry et al., 2021; Mumford et al., 2014; Ozga-Hess et al., 2020; Rose et al., 2007; Storr et al., 2004; Suftin et al., 2009; Villanti et al., 2015; Wackowski et al., 2019; Xian et al., 2005) nicotine and other substance users have been identified using latent variable mixture modeling. Yet, of the LVMM studies that have been conducted with adult respondents, only eleven have incorporated items related to the use of e-cigarettes (Boyle et al., 2019; Erickson et al., 2014; Ganz et al., 2019; Haardörfer et al., 2015; Kypriotakis et al., 2018; Lee et al., 2019; Lisha et al., 2019; Ozga-Hess et al., 2020; Villanti et al., 2015). This dearth of adult e-cigarette LVMM studies likely reflects how new these products

are to the market and how recently they have become popularized in society. These adult e-cigarette LVMM studies have centered on classifying participant responses based on a variety of features including e-cigarette puff topography patterns (Lee et al., 2019), product type (Erickson et al., 2014; Ozga-Hess et al., 2020), psychiatric disorders (Ganz et al., 2019), and patterns of tobacco and other substance use (Boyle et al., 2019; Haardörfer et al., 2015; Kypriotakis et al., 2019; Lisha et al., 2019; Villanti et al., 2015).

To the author's knowledge, no studies have directly classified users' e-cigarette outcome expectancies. However, two studies are salient to the present work. First, Boyle and colleagues (2019) gathered reasons for lifetime e-cigarette use among a sample of adults by presenting participants with a randomized list of common reasons for e-cigarette use. Participants were also provided with an opportunity to list "other reasons" for trying e-cigarettes. Latent class analysis revealed four classes of lifetime e-cigarette users based on their reasons for trying e-cigarettes: younger experimenters, 14.0%; using to quit/cut down, 35.2%; concurrent or dual users, 20.6%; and curious adults, 30.3%. Contrary to those "using to quit" and "curious adults," "younger experimenters" and "concurrent users" reported a preference for e-cigarette flavors and described first trying e-cigarettes for enjoyment. Very few (7.7%) young adults aged 18-24 were classified in the "using to quit/cut down group" as compared to the "younger experimenter" class, which was comprised of more than half (63.7%) of the young adult lifetime e-cigarette users in this sample. Overall, this study demonstrates that subgroups of lifetime e-cigarette users exist within the larger, heterogenous population and e-cigarette users can be categorized based on their reasons for initially using e-cigarettes. Future e-cigarette use prevention and intervention approaches will likely require a nuanced and complex strategy for targeting e-cigarette use as individual nicotine users' needs (e.g., heavy, chronic smokers versus young, curious never

smokers) are identified in the general population. By identifying explicit ideas that led these e-cigarette users to initiate use, prevention efforts can more precisely and effectively address these individual needs.

Second, Ganz and colleagues (2019) used latent class analysis to identify the following three unique classes of adults based on the severity of their psychiatric internalizing and externalizing symptoms: 1) "normative," 2) "severe internalizing and non-violent externalizing," and 3) "severe." Ultimately, classes differed based on demographic characteristics and tobacco use type (e.g., cigarette, cigar, e-cigarette, pipe, hookah, smokeless tobacco). Specifically, the "severe" class was comprised of young (under age 35), males who were less educated and had a lower income than either of the other two classes. Notably, findings from this study echoed transdiagnostic vulnerability framework assumptions as tobacco use prevalence was observed to be the highest in the "severe" class, followed by the "severe internalizing and non-violent externalizing" class, and was lowest in the "normative" class. Specifically, the "severe" psychiatric symptom class exhibited a higher prevalence of cigarette smoking and vaping when compared to either of the less severe classes. Likewise, the "severe internalizing and non-violent externalizing" class reported more cigarette smoking and vaping than the "normative" class. Finally, members of the "severe" and "severe internalizing and non-violent externalizing" classes were more likely to report poly tobacco use when compared to the "normative" class. Overall, this study provides evidence that severity of nicotine use patterns and psychological symptoms are systematically related among young adults. However, previous e-cigarette use studies among adults have demonstrated a different pattern (e.g., no relationship between past 12-month e-cigarette and lifetime use and generalized anxiety and social phobia; Chou et al., 2017),

suggesting that more work is needed to clarify these processes among adults (Garey et al., 2020; Versella et al., 2019).

Together, these studies have helped to provide a broad overview of individual e-cigarette use patterns. This said, the measurement of e-cigarette outcome expectancies is new and as such, much more work is needed to gain a better understanding of how these cognitive processes underlie subsequent behavioral health patterns (Brandon et al., 2019; Pokhrel et al., 2018). Additionally, McCarthy and colleagues (2015) highlight the importance of considering a broad array of psychopathology in predicting latent classes as few investigators have taken transdiagnostic emotional features into account when developing latent profiles.

Purpose

The purpose of the present study is to gain a better understanding of the etiology of e-cigarette use habits among young adults. To accomplish this aim, the investigator empirically derived reliable, clinically relevant profiles of young adult e-cigarette outcome expectancies using latent variable mixture modeling. Group membership was predicted using demographic and mental health-related variables. Consistent with the National Institute on Drug Abuse's (NIDA; 2020) aims, this work will aid in the development of programs designed to minimize and reduce nicotine use. Additionally, findings will be useful for developing future research programs as little is currently known about differences between young adult e-cigarette users' expectancies and emotional protective or risk factors for e-cigarette use initiation.

Statement of Hypotheses

Hypothesis 1

The investigator hypothesized that within the larger heterogeneous population of young adults, two or more homogenous profiles or subgroups of young adults with differing e-cigarette

outcome expectancies exist. Groups were differentiated based on profiles comprised of e-cigarette outcome expectancies as measured by the long version of the revised youth e-cigarette outcome expectancies measure by Pokhrel and colleagues (2018). Four subscales were used to capture positive expectancies (social enhancement, affect regulation, positive "smoking" experience, positive sensory experience) and four subscales assessed negative expectancies (negative health consequences, negative social consequences, addiction concern, negative sensory experience). The investigator anticipated that unique classes would have distinct patterns of responding on e-cigarette outcome expectancy subscales. Latent profile analysis was used to empirically derive these subgroups. Based on existing empirical literature concerning individuals' perceptions of e-cigarette use, the investigator anticipated that multiple classes of young adults would be identified based on their e-cigarette outcome expectancies (Boyle et al., 2019).

Hypothesis 2

It was hypothesized that demographic variables would influence group membership probability. Specifically, age, sex, race, ethnicity, and level of education were used to predict the probability of each respondent's e-cigarette outcome expectancy class membership.

Hypothesis 2a. Based on previous literature, the investigator hypothesized that with increasing age, participants would endorse lower positive e-cigarette outcome expectancies (positive "smoking" experience, positive sensory experience, affect regulation, social enhancement) and higher negative outcome expectancies for e-cigarettes (Boyle et al., 2019; Pokhrel et al., 2014).

Hypothesis 2b. Given that males are more likely to endorse ever trying e-cigarettes, it was hypothesized that male participants would be grouped with those endorsing higher positive

"smoking" and sensory experience expectancies (Piñeiro et al., 2016; Suftin et al., 2013). Females were expected to endorse high negative e-cigarette outcome expectancies. Mixed results have been reported concerning social enhancement outcome expectancies and sex (e.g., males rated higher, Piñeiro et al., 2016; females rated higher, Pokhrel et al., 2014). Therefore, the investigator hypothesized that distinct differences in patterns of social enhancement outcome expectancies between classes would emerge and sex would vary among these unique classes of participants. Consistent with previous literature, the investigator hypothesized that female participants would be grouped with those endorsing high affect regulation outcome expectancies (Leventhal et al., 2016; Pokhrel et al., 2014).

Hypothesis 2c. Based on previous findings demonstrating that Black individuals are more likely than White or Hispanic individuals to use e-cigarettes for smoking cessation purposes (Webb Hooper & Kolar, 2016), the investigator anticipated that Black participants would be grouped with participants endorsing high addiction concern e-cigarette expectancies. White participants were expected to endorse high positive e-cigarette outcome expectancies (positive "smoking" experience, positive sensory experience, affect regulation, social enhancement; Hoyt et al., 2020).

Hypothesis 2d. It was hypothesized that participants with a higher level of education (e.g., graduate or professional degree) would be more likely to endorse positive e-cigarette outcome expectancies than participants with a lower level of education (e.g., Grade 6 or less; Zvolensky et al., 2018).

Hypothesis 3

Additionally, it was hypothesized that transdiagnostic vulnerability phenotypes would influence group membership probability. Specifically, levels of anhedonia, anxiety sensitivity,

and distress tolerance were used to predict group membership. Anhedonia, anxiety sensitivity, and distress tolerance were assessed via total scores on the Snaith-Hamilton Pleasure Scale (SHAPS; Snaith et al., 1995), the Anxiety Sensitivity Inventory (ASI-3; Taylor et al., 2007), and the Distress Tolerance Scale (DTS; Simons & Gaher, 2005), respectively.

Hypothesis 3a. It was hypothesized that individuals endorsing greater difficulty experiencing pleasure (high anhedonia), as demonstrated by low SHAPS scores, would endorse high positive e-cigarette outcome expectancies (positive "smoking" experience, positive sensory experience, affect regulation, social enhancement) and low negative outcome expectancies for e-cigarettes (negative health consequences, addiction concern, negative social consequences, negative sensory experience). As such, individuals who experience elevated anhedonic symptoms were expected to be classified into group(s) with predominantly positive e-cigarette outcome expectancies.

Hypothesis 3b. Based on aforementioned theory and previous literature, the investigator hypothesized that individuals who endorse high levels of anxiety sensitivity, as demonstrated by higher ASI-3 scores, would also report high affect regulation outcome expectancies (Zvolensky et al., 2019c). It was hypothesized that individuals with high anxiety sensitivity would be grouped with cigarette only users and dual users. E-cigarette users were expected to endorse high negative outcome expectancies (negative health consequences, addiction concern, negative social consequences, and negative sensory experience) for e-cigarettes.

Hypothesis 3c. Based on existing theory, it was hypothesized that as perceived difficulty tolerating distress increased, as evidenced by low DTS scores, affect reduction outcome expectancy scores were expected to increase leading participants low in distress tolerance to be classified into associated high affect reduction expectancy classes (Leventhal & Zvolenksy,

2015). It was also hypothesized that participants with low DTS scores would endorse high positive "smoking" and sensory experience and social enhancement outcome expectancies for e-cigarettes.

CHAPTER 2

METHODS

Participants

Please see Table 1 on page 29 for demographic information of this sample. Previous findings indicate that adult e-cigarette use patterns differ across developmental periods (Versella et al., 2019). For this reason, adults between the ages of 18 and 40 were eligible to participate in this study. This age range was purposefully selected to add to existing e-cigarette literature specifically pertaining to this cohort. Exclusionary criteria for this study included: a) being younger than 18 or older than 40 and b) lack of survey comprehension (e.g., due to being a non-English speaker).

Approximately equal groups of participants were recruited based on smoking status. Groups were as follows: 1) current e-cigarette only users with a lifetime history of cigarette smoking, 2) current e-cigarette only users without a lifetime history of cigarette smoking, 3) current cigarette smokers who have not smoked e-cigarettes in the past 30 days, 4) current dual-users (e-cigarette users and cigarette smokers), 5) never users, 6) lifetime dual use history, not current, 7) lifetime cigarette smoking history (no current use) with no e-cigarette use history, and 8) lifetime e-cigarette use history (no current use) without lifetime cigarette smoking history. "Current use" was defined as any use in the past 30 days (Cullen et al., 2019).

Table 1. Demographic information

Variable	Statistic
Age (years), *M (SD)*	30.02 (5.80)
Sex	
Female	51.8%
Male	48.2%
Race	
American Indian or Alaska Native	0.4%
Asian	7.3%
Black or African American	7.5%
NA/Other	2.6%
Native Hawaiian or Other Pacific Islander	0.2%
White	79.1%
Multi-racial	3.0%
Ethnicity	
Hispanic/Latinx	10.5%
Education	
Graduate or Professional Degree	11.7%
Bachelor's Degree	48.0%
Associate's Degree	26.9%
High School	13.2%
Middle School	0.2%
Grade 6 or less	0%

"Lifetime history of use" was defined as ever smoking in their lifetime (National Center for Health Statistics, 2017). Dual-users met criteria for concurrent use if they smoked and vaped at least once in the past 30 days (Leventhal et al., 2016).

Materials and Procedures

Prior to recruiting participants, approval for this study was obtained from the University of Mississippi's Institutional Review Board (IRB). An anonymous web-based survey was created on Qualtrics, an online survey platform, and distributed using Amazon.com's Mechanical Turk (MTurk). MTurk is an online marketplace where "workers" can be recruited by "requesters" to complete tasks. Previous assessment of the MTurk participant pool has revealed that the quality of the data is comparable to published research (Buhrmester et al., 2011). Further, MTurk samples tend to be more diverse than typical Internet samples (Buhrmester et al.,

2011). Notably, this platform has been used to successfully obtain e-cigarette data among adult participants (Versella et al., 2019).

Cloud Research (formerly known as Turk Prime) was used to post the survey on MTurk (Litman, Robinson, & Abberbock, 2017). When the survey for the present study was made available to the MTurk community, it was advertised as, "An examination of American adult's beliefs about using e-cigarettes" and a thorough description of the study was provided. Recruitment was limited to participants with US IP addresses only. Participants were asked to click a link to begin the survey. At the beginning of the survey, participants were asked to provide informed consent electronically. After providing their informed consent to participate, participants were asked to complete the initial screener. In order to assess eligibility criteria, the initial screener gathered the participant's age and information concerning smoking status as described below. Participants who did not meet eligibility criteria were thanked for their willingness to participate and informed that they did not qualify for the present study. Eligible participants were invited to complete the full survey.

Eligible participants were asked to complete a demographics questionnaire, which gathered information about their sex, race/ethnicity, and highest level of education. Subsequently, they were asked to complete the transdiagnostic phenotype measures (SHAPS, ASI-3, DTS) and youth e-cigarette outcome expectancies measure. Per Meade and Craig's (2012) recommendations for collecting high-quality data, participants were presented with six attention check questions (e.g., in the middle of a matrix of questions, participants were instructed to select a specific response to demonstrate attention) throughout the survey. At the end of the survey, respondents were required to complete a CAPTCHA verification item before receiving a "dynamic secret password" that was uniquely generated for each participant. After

receiving their password in Qualtrics, participants were required to enter their unique password in MTurk to request compensation. Eligible participants who responded attentively were paid $2 for their work.

Attentive responses were screened using criteria recommended by Buchanan & Scofield (2018). Specifically, 1) click counts, meaning number of clicks in relation to questions per page (i.e., must click at least 15 times if there are 15 questions on the page), 2) number of scale items selected (i.e., participants who used over 75% of scale items were flagged as "low effort"), and attention check items were taken into account. Participants were excluded if they failed two or more attention checks or if they failed one attention check and failed to meet at least one of the other two criteria. Participants were also excluded if they failed to meet minimum click count standards and used 75% or more of the scale items on a given scale with the exception of the youth e-cigarette outcome expectancies measure which is expected to have a larger amount of variation than other measures. At the end of the survey, participants were directed to freely available clinical resources (e.g. ABCT's find a therapist page, smoking cessation resources).

Measures

Initial Screener

In order to screen respondents for study eligibility, they were asked to provide their age. Additionally, they were shown a photograph of various types of e-cigarettes and a description of an e-cigarette was provided. They were asked, "Have you ever tried a [*cigarette/e-cigarette*]?" If the participant endorsed ever using the product, they were asked, "How many days out of the past 30 days did you use this product?" This procedure is similar to Simon and colleague's approach for assessing smoking and vaping status (2016). If participants were eligible for the study, they were asked to complete the following measures.

Demographics Questionnaire

Eligible participants were asked to provide their sex, race/ethnicity, and highest level of education. Information about race was captured by asking participants, "What is your race?" and instructing participants to "Check all that apply" from the following list: American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, White and "other." Ethnicity was assessed by allowing participants to select either "Hispanic/Latinx" or "Not Hispanic/Latinx". Education options ranged from 1-6, where 1 = Grade 6 or less; 2 = Middle school; 3 = High school; 4 = Associate's degree, some college, or technical school; 5 = Bachelor's degree; 6 = Graduate or professional degree.

E-Cigarette Outcome Expectancies

The long version of the revised youth e-cigarette outcome expectancies measure (Pokhrel et al., 2014, 2015, 2018) is a valid and reliable 55-item measure used to capture young adults' (aged 18-40) positive and negative beliefs about the consequences of smoking e-cigarettes. This scale is comprised of four positive (e.g., social enhancement, affect regulation, positive sensory experience, positive "smoking" experience) and four negative (e.g., negative social experience, negative health consequences, addiction concern, negative sensory experience) outcome expectancy factors. Using a 10-point scale, participants were asked to rate the likelihood that e-cigarette use would decrease or increase their chance of feeling good. A total score was calculated by taking the sum of all the responses in each outcome expectancy factor. Higher scores represent a stronger belief in the likelihood that the e-cigarette outcome expectancy will occur.

Transdiagnostic Phenotype Measures

Anhedonia. The Snaith-Hamilton Pleasure Scale (SHAPS) is a 14-item self-report questionnaire used to measure a person's ability to experience pleasure "in the last few days." The SHAPS directs participants to indicate agreement with items using a 4-point Likert scale (1 - *Strongly Disagree* to 4 - *Strongly Agree*; Snaith et al., 1995). Respondents scores on each item were converted to binary scores and summed to create the SHAPS total score, which can range from 0 to 14. Higher scores indicate greater ability to experience pleasure.

The SHAPS has been demonstrated to be useful when evaluating responses from clinical and non-clinical samples. The SHAPS has good divergent and convergent reliability as it negatively correlates with measures assessing positive affect and satisfaction with life (PANAS Positive Affect r = -.25; SWLS r = -.18) and it significantly correlates with the Beck Depression Inventory (clinical: r = .64; p < .001; college students: r = .23; p < .05). Further, in a sample of undergraduate students, the SHAPS demonstrated good internal consistency (Cronbach's alpha = .91) and adequate test-retest reliability (ICC = 0.70; Franken et al., 2007). Among clinical inpatients, high internal consistency for the measure was also noted (Cronbach's alpha = .94; Franken et al., 2007). The SHAPS has also been useful for work with college students (Leventhal et al., 2006).

Anxiety Sensitivity. The Anxiety Sensitivity Index-3 (ASI-3) is an 18-item self-report questionnaire used to assess fear of arousal-related sensations or anxiety sensitivity. Responses are rated on a 5-point Likert scale (0 - *Very Little* to 4 - *Very Much*). The ASI-3 produces a total score and also has three subscales: physical, cognitive, and social concerns. For the purpose of this study, a total score was calculated. Total scores range from 0-72 and were derived by summing responses. Scores greater than or equal to 23 exceed the clinical cut-off and are

indicative of clinically significant levels of anxiety sensitivity that is similar to patients with anxiety disorders. In prior research, the mean total score among American and Canadian participants was 12.8 (SD = 10.6; Taylor et al., 2007). Among treatment-seeking cigarette smokers, the ASI-3 demonstrated high internal consistency (Cronbach's alphas ranged from .84 to .92 for the three subscales) and adequate test-retest reliability (*r*s ranged from .60 to .82 for the three subscales; Farris et al., 2015).

Distress Tolerance. The Distress Tolerance Scale (DTS) is a well-researched instrument used to assess a person's perceived capability to withstand negative emotional states using 15-items rated on a 5-point Likert scale (1 – *Strongly Agree* to 5 – *Strongly Disagree*). A total DTS score was calculated by summing all items. Total scores range from 15-75 with higher scores indicating higher levels of perceived capability to withstand distress. The measure contains four subscales: absorption, tolerance, appraisal, and regulation (Simons & Gaher, 2005). For the purpose of this study, the total score was used.

The utility of the DTS has been demonstrated among patients with panic disorder, clinical controls, non-clinical community members, and college students (Schmidt et al., 2006; Simons & Gaher, 2005). Specifically, among college students, the DTS demonstrated good convergent, discriminant, and criterion validity as evidenced by negative associations with measures of affective distress (e.g., negative affectivity: $r = -.59$) and affect lability ($r = -.51$) and positive associations with measures of positive affectivity ($r = .26$) and mood regulation expectancies ($r = .54$; Simons & Gaher, 2005). Internal consistency of the measure is also good ($\alpha = .89$; Simons & Gaher, 2005). Test-retest reliability is acceptable (Factor 1: $r = .63$, Factor 2: $r = .66$; Schmidt et al., 2006).

CHAPTER 3

DATA ANALYSIS

Data Cleaning and Statistical Analysis Plan

Using Statistical Package for the Social Sciences software version 27 (SPSS), inconsistent data (e.g., conflicting responses from the same participant) and inattentive responses (e.g., responses from participants who failed to respond appropriately to the embedded attention check items, low click counts) were removed from the data set prior to data analyses (Meade & Craig, 2012). Missingness was minimal as ethnicity was the only variable with missing data and missingness occurred at 4.3%. Since predictor variable ranges differed widely, predictor variables were first converted to z-scores before follow-up analyses were conducted.

To empirically derive subgroups of e-cigarette outcome expectancies of young adult participants, the investigator used Mplus version 8.4 to conduct latent profile analyses (LPA; Muthén & Muthén, 1998-2017). Please see Figure 1 on page 36 for a conceptual model. This analysis incorporated full information maximum likelihood (FIML; Little et al., 2014). Maximum likelihood with robust standard errors (MLR) was also utilized to account for missingness and univariate skewness and kurtosis.

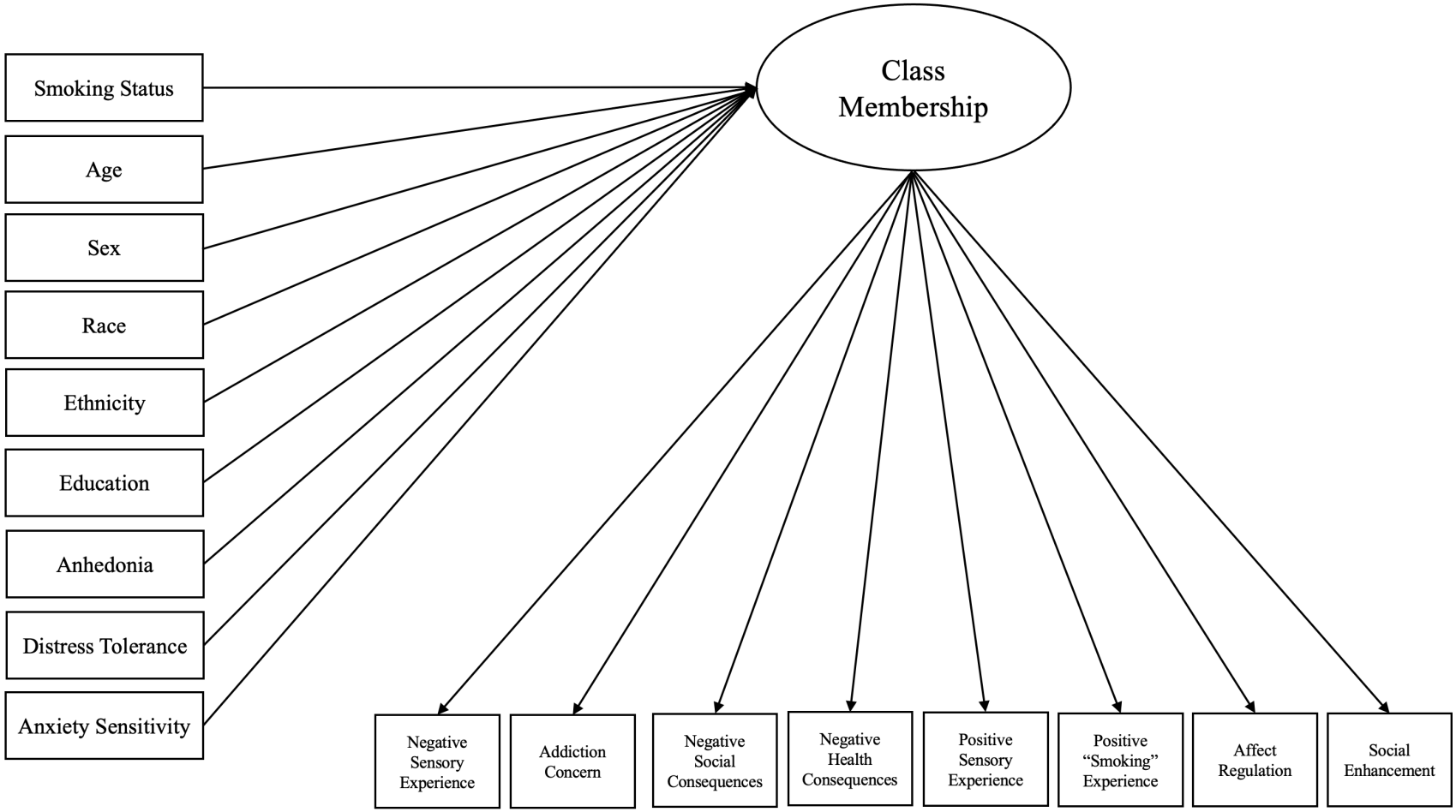

Figure 1. Conceptual Model of Proposed Latent Profile Analysis (LPA) of E-Cigarette Outcome Expectancies

Model Selection and Interpretation

To detect the most accurate model based on e-cigarette outcome expectancy indicators, the investigator relied on statistical indices and theory. First, models were compared using the Bayesian Information Criteria (BIC), with lower BIC value indicating better model fit (Berlin et al., 2014; Schwartz, 1978). Second, the investigator used the Bootstrap Likelihood Ratio test (BLRT) and Lo-Mendell-Rubin (LMR) test to discern if a model with an additional class was a statistical improvement over the previous model with fewer classes (e.g., k classes versus k-1 classes; Berlin et al., 2014; Lo, Mendell, & Rubin, 2001; Nylund et al., 2007; Pearson et al., 2017; Vuong, 1989).

Additionally, the investigator considered class sizes when selecting the best model (Berlin et al., 2014). All classes were larger than proposed criteria. Of note, small classes were defined as proportionally less than 1.0% and/or $n < 25$ (Lubke & Neale, 2006). In addition to these considerations, parsimony was favored and the model with the strongest statistical indices and most clinically meaningful result was selected (Tein et al., 2013).

Once a class solution was resolved, entropy (e.g., defined as a statistic that indicates how accurately individuals are probabilistically assigned to given classes) was examined in order to gather more details about the selected model. Entropy ranges from 0-1 and values closer to one are thought to have higher classification accuracy (Berlin et al., 2014). In this analysis, entropy exceeded .8, which indicates acceptable separation between latent classes (Weller, Bowen, & Faubert, 2020).

Prediction Analyses

After concluding which class solution was the most accurate based on the e-cigarette outcome expectancy indicators, demographic (age, sex, race/ethnicity, education level) features,

smoking status, and transdiagnostic phenotypes (anhedonia, anxiety sensitivity, distress tolerance) were included in the LPA as predictors of class membership. This was done in a three-step procedure that treats predictors as auxiliary variables (Asparouhov & Muthén, 2014). This ensured that the class solution did not shift when predictor variables were added to the model.

CHAPTER 4

RESULTS

Correlations, means, standard deviations, and ranges for demographic characteristics, transdiagnostic vulnerability factors, and e-cigarette outcome expectancy variables are shown in Table 2 on page 40. Consistent with hypothesis 1, subgroups of young adults with distinct e-cigarette outcome expectancies were differentiated. Model fit statistics for LPA classes 1-6 are shown in Table 3 (see page 41). Notably, all class sizes were adequate. The BLRT was significant for classes 2-6, indicating that each model represented a statistical improvement over the previous model with fewer classes. The LMR was significant for the 2-class model ($p <$ .001) and trended toward significance for the 3-class model ($p = .056$). When choosing the final class solution, parsimony was favored. Ultimately, the 3-class model was chosen due to the model's clinical significance. The loglikelihood of the 3-class model was replicated 4 times, indicating that global (vs. local) maxima were likely found.

The 3-class model produced the following classes: 1) "Vape Apathetic" (characterized by participants with low negative and low positive expectancies); 2) "Vape Positive" (characterized by participants with low negative and high positive expectancies); 3) "Vape Negative" (characterized by participants with high negative and low positive expectancies). Final latent class counts based on their most likely latent class membership were as follows: Class 1, $n =$ 102; Class 2, $n = 204$; Class 3, $n = 200$. Please see Figure 2 on page 42 for a visual representation of estimated means for e-cigarette outcome expectancy variables.

Table 2. Correlations of demographic, transdiagnostic vulnerability, and vaping outcome expectancy variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. Social Enhancement	-															
2. Affect Regulation	.497**	-														
3. Positive Sensory Experience	.552**	.553**	-													
4. Positive Smoking Experience	.594**	.680**	.610**	-												
5. Negative Health Consequences	-.164**	-.262**	-.381**	-.367**	-											
6. Negative Social Consequences	-.101*	-.305**	-.276**	-.387**	.557**	-										
7. Addiction Concern	-.007	-.078	-.223**	-.104*	.668**	.436**	-									
8. Negative Sensory Experience	-.147**	-.399**	-.506**	-.460**	.589**	.607**	.436**	-								
9. Age	-.142**	-.020	-.069	-.030	-.092*	-.030	-.056	-.011	-							
10. Sex	.186**	.164**	.145**	.208**	-.195**	-.107*	-.089*	-.115**	.078	-						
11. Race	-.145**	-.012	-.020	-.018	.028	-.041	.076	-.029	.073	.089*	-					
12. Ethnicity	-.120**	.031	-.041	-.042	.012	-.003	.078	-.038	.101*	.022	.129**	-				
13. Education	.050	.186**	.111*	.186**	-.048	-.139**	-.028	-.140**	-.170**	-.010	.065	-.042	-			
14. Anxiety Sensitivity	.282**	.179**	.113*	.090*	.144**	.160**	.163**	.086	-.152**	-.025	-.085	-.073	.044	-		
15. Anhedonia	.093*	.089*	.102*	.100*	-.068	.027	-.093*	-.045	-.047	.203**	-.067	.001	.083	.239**	-	
16. Distress Tolerance	-.180**	-.133**	-.047	-.070	-.116**	-.095*	-.198**	-.054	.115**	.139**	.072	.055	-.058	-.579**	-.123**	-
n	506	506	506	506	506	506	506	506	506	506	506	484	506	506	506	506
M	16.43	28.17	7.61	21.59	24.30	19.29	16.55	14.04	30.02	-	-	-	-	24.07	1.33	3.10
SD	17.97	17.42	6.97	17.33	9.47	12.45	7.39	8.77	5.80	-	-	-	-	15.28	2.22	.915
Min	0	0	0	0	0	0	0	0	18	-	-	-	-	0	0	1.00
Max	90	63	27	63	36	45	27	27	40	-	-	-	-	72	14	5.00

Notes. *Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).

Table 3. Model comparison for latent profile analyses

Number of Classes	Entropy	BIC	LMR *p* value	BLRT *p* value	Smallest Class Size (*n,* %)
1	NA	11579.343	NA	NA	506 (100%)
2	0.861	10607.989	0.0000*	0.0000*	212 (42%)
3	**0.842**	**10285.738**	**0.0566**	**0.0000***	**102 (20%)**
4	0.841	10085.378	0.0953	0.0000*	83 (16%)
5	0.865	9923.925	0.819	0.0000*	57 (11%)
6	0.879	9884.901	0.4122	0.0000*	26 (5%)

Notes. The model solution chosen is **bolded**. NA indicates not applicable; BIC, Bayesian information criterion; BLRT, Bootstrap Likelihood Ratio Test; LMR, Lo-Mendell-Rubin test.

*$p < .001$

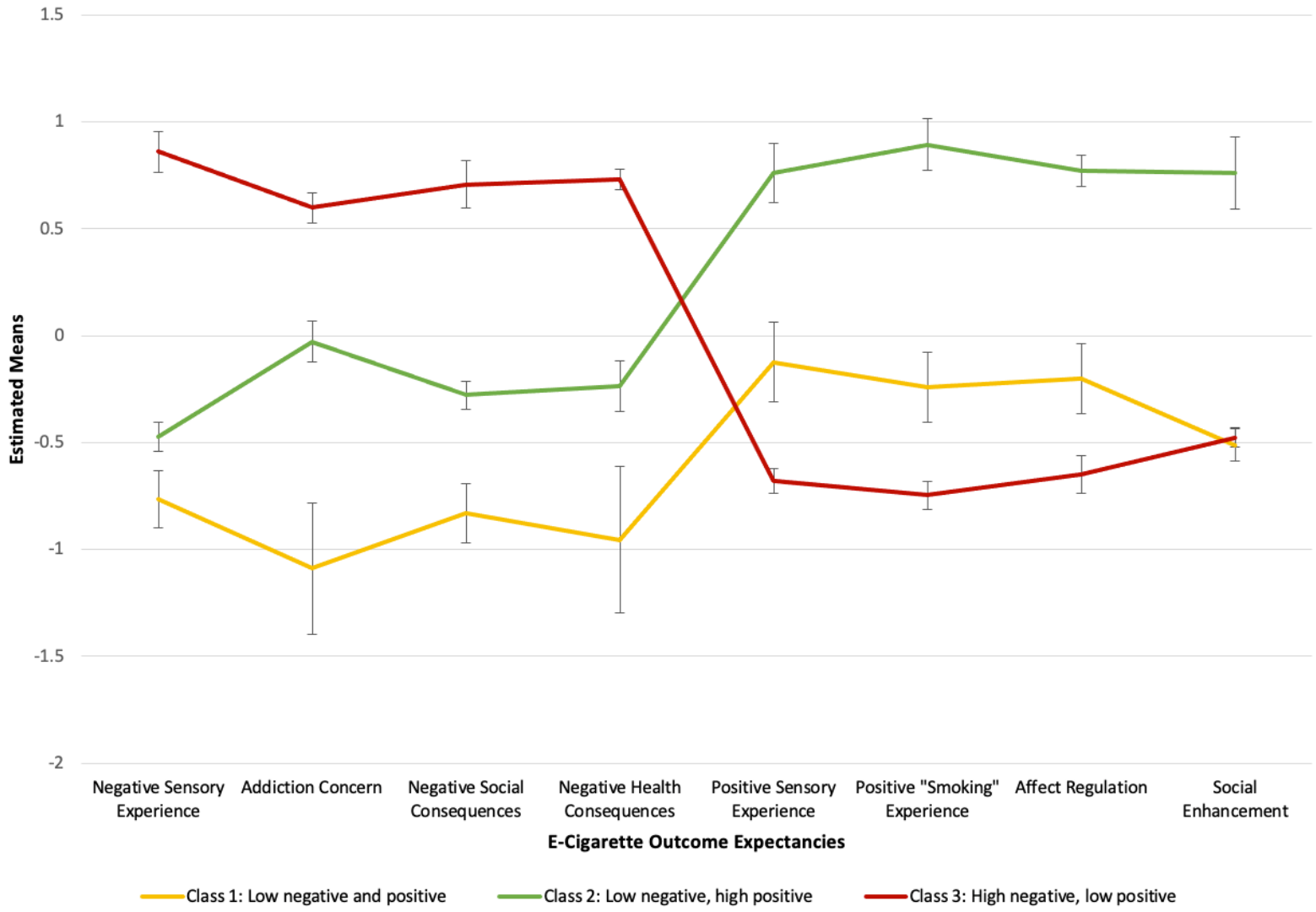

Figure 2. Results of Latent Profile Analysis. Latent class means from the revised youth e-cigarette outcome expectancies measure and error bars representing the 95% confidence intervals are shown above.

Prediction Analyses

Demographics

Table 4 shown on page 44 outlines demographic features, nicotine use status, and transdiagnostic vulnerability responses of each class. Hypothesis 2 proposed that demographic variables including age, sex, race, ethnicity, and level of education, would influence group membership probability. Sex, race, and level of education predicted group membership. Please see Table 5 on page 45 for demographic predictions. Prediction analyses revealed that women were very unlikely to be in the "Vape Positive" group compared to the "Vape Negative" group or "Vape Apathetic" group (OR = 0 and 0, respectively; $p < .001$). Asian participants and Black participants were less likely to be in the "Vape Negative" group in comparison to the "Vape Apathetic" group (OR = 0.049 and 0.059, respectively; $p < .001$) or the "Vape Positive" group (OR for Asian participants = 0.200, $p < .05$; OR for Black participants = 0.063, $p < .001$). White participants were less likely to be in the "Vape Negative" group in comparison to the "Vape Apathetic" group (OR = 0.136, $p < .05$). Participants who identified as "Other Race" were less likely to be in the "Vape Positive" group in comparison to the "Vape Apathetic" group (OR = 0.010, $p < .001$). Participants with an Associate's degree, a Bachelor's degree or graduate or professional degrees were very unlikely to be in the "Vape Positive" group in comparison to the "Vape Apathetic" group or the "Vape Negative" group (OR = 0, $p < .001$ for all findings). Notably, age did not predict group membership.

Table 4. Latent class members' demographic features, nicotine use status, and transdiagnostic vulnerability responses

	Class 1	Class 2	Class 3
	N = 102, 20.2%	N = 204, 40.3%	N = 200, 39.5%
	N (%)	N (%)	N (%)
Sex (female)	62 (60.8)	98 (48.0)	102 (51.0)
Race			
American Indian or Alaska Native	-	-	2 (1.0)
Asian	11 (10.8)	14 (6.9)	12 (6.0)
Black or African American	8 (7.8)	20 (9.8)	10 (5.0)
NA/Other	5 (4.9)	2 (1.0)	6 (3.0)
Native Hawaiian or Other Pacific Islander	-	-	1 (0.5)
White	76 (74.5)	162 (79.4)	162 (81.0)
Multi-racial	2 (2.0)	6 (2.9)	7 (3.5)
Ethnicity (Hispanic/Latinx)	13 (12.7)	21 (10.3)	17 (8.5)
Education Level			
Graduate or Professional Degree	14 (13.7)	15 (7.4)	30 (15.0)
Bachelor's Degree	42 (41.2)	93 (45.6)	108 (54.0)
Associate's Degree	29 (28.4)	57 (27.9)	50 (25.0)
High School	17 (16.7)	38 (18.6)	12 (6.0)
Middle School	-	1 (0.5)	-
Smoking Status			
Current e-cigarette only users[a]	11 (10.8)	46 (22.5)	6 (3.0)
Current e-cigarette only users[b]	18 (17.6)	33 (16.2)	11 (5.5)
Current cigarette smokers[c]	21 (20.6)	27 (13.2)	12 (6.0)
Dual-users	13 (12.7)	48 (23.5)	3 (1.5)
Never users	7 (6.9)	4 (2.0)	49 (24.5)
No past month nicotine use[a, c]	14 (13.7)	23 (11.3)	36 (18.0)
No past month smoking[a, d]	7 (6.9)	5 (2.5)	54 (27.0)
No past month nicotine use[b, c]	11 (10.8)	18 (8.8)	29 (14.5)
	M (SD)	*M (SD)*	*M (SD)*
Age (years)	30.69 (5.88)	29.33 (5.55)	30.39 (5.96)
Transdiagnostic Vulnerability Factors			
Anhedonia	1.43 (2.34)	1.59 (2.39)	1.02 (1.99)
Distress Tolerance	3.36 (.936)	2.99 (.850)	3.087 (.946)
Anxiety Sensitivity	18.39 (13.19)	27.52 (15.38)	23.45 (15.30)

Notes. [a]indicates lifetime cigarette smoking history; [b]indicates no lifetime cigarette smoking history; [c]indicates lifetime e-cigarette use history; [d]indicates no lifetime e-cigarette use history

Table 5. Comparative demographic predictions of latent class membership

Reference Class	Comparison Class	Predictor	SE	OR	*p* value
1: Low negative and positive expectancies	2: Low negative, high positive expectancies	Sex (female)	0.000	0.000	0.000
		Other race	0.221	0.010	0.000
		Graduate or professional degree	0.000	0.000	0.000
		Bachelor's degree	0.000	0.000	0.000
		Associate's degree	0.000	0.000	0.000
3: High negative, low positive expectancies		Sex (female)	0.000	0.000	0.000
		Graduate or professional degree	0.000	0.000	0.000
		Bachelor's degree	0.000	0.000	0.000
		Associate's degree	0.000	0.000	0.000
1: Low negative and positive expectancies	3: High negative, low positive expectancies	Asian	0.145	0.049	0.000
		Black	0.167	0.059	0.000
		White	0.376	0.136	0.022
2: Low negative, high positive expectancies		Asian	0.404	0.200	0.048
		Black	0.126	0.063	0.000

Notes. Redundant comparisons were excluded from the table. Only findings significant at the $p < .05$ were included in this table.

Smoking Status

Current e-cigarette users (with and without lifetime cigarette smoking history) and current cigarette smokers were much less likely to be in the "Vape Apathetic" group or the "Vape Negative" group compared to the "Vape Positive" group (OR = 0, $p < .001$). When comparing their likelihood to be in the "Vape Apathetic" group versus the "Vape Negative"

group, these individuals were significantly less likely to be in the "Vape Apathetic" group in comparison to the "Vape Negative" group (OR = 0.187; 0.257, 0.269, respectively, $p < .01$).

Current dual-users were very unlikely to be in the "Vape Apathetic" group compared to the "Vape Positive" group (OR = 0, $p < .001$). Current dual users were also very unlikely to be in the "Vape Negative" group compared to the "Vape Positive" group (OR = 0, $p < .001$).

Never users were less likely to be in the "Vape Negative" group compared to the "Vape Positive" group (OR = 0, $p < .001$). In comparison to the "Vape Negative" group (OR = 0.011, $p < .001$) and the "Vape Positive" group (OR = 0, $p < .001$), never users were less likely to be in the "Vape Apathetic" group. This same pattern was evidenced among lifetime dual users with no past month use and lifetime smokers with no past month use who denied ever trying e-cigarettes. Please see Table 6 on page 48 for specific values.

Transdiagnostic Variables

For hypothesis 3, it was predicted that transdiagnostic vulnerability phenotypes, anhedonia, anxiety sensitivity, and distress tolerance, would influence group membership probability. This was partially confirmed. Specifically, a one standard deviation increase in anhedonia resulted in a lesser likelihood of being classified in the "Vape Negative" group compared to the "Vape Positive" or "Vape Apathetic" groups (OR = 0.660, $p < .05$; OR = 0.580, $p < .01$, respectively). Additionally, a one standard deviation increase in anxiety sensitivity was associated with a 2.066 increase in the odds of class membership in the "Vape Positive" group compared to the "Vape Apathetic" group ($p < .05$). Finally, a one standard deviation increase in anxiety sensitivity was associated with a lesser likelihood of being classified in the "Vape Apathetic" group compared to the "Vape Positive" group (OR = 0.484, $p < .001$) or the "Vape Negative" group (OR = 0.445, $p < .001$). It was hypothesized that participants with low distress

tolerance scores would be classified with participants endorsing high positive "smoking" and sensory experience, high affect regulation, and high social enhancement outcome expectancies for e-cigarettes. However, distress tolerance did not influence group membership probability in this sample.

Table 6. Comparative smoking status and transdiagnostic phenotype predictions of latent class membership

Reference Class	Comparison Class	Predictor	SE	OR	*p* value
3: High negative, low positive expectancies	1: Low negative and positive expectancies	Current e-cigarette only users with lifetime cigarette smoking history	0.172	0.187	0.000
		Current e-cigarette only users without lifetime cigarette smoking history	0.202	0.257	0.000
		Current cigarette smokers, no past month e-cigarette use	0.215	0.269	0.001
		Never users	0.009	0.011	0.000
		Lifetime smokers and e-cigarette users, no past month use	0.036	0.052	0.000
		Lifetime smokers, no past month use, without lifetime e-cigarette use history	0.010	0.012	0.000
		Anxiety sensitivity	0.137	0.445	0.000
2: Low negative, high positive expectancies		Current e-cigarette only users with lifetime cigarette smoking history	0.000	0.000	0.000
		Current e-cigarette only users without lifetime cigarette smoking history	0.000	0.000	0.000
		Current cigarette smokers, no past month e-cigarette use	0.000	0.000	0.000
		Dual-users	0.000	0.000	0.000
		Never users	0.000	0.000	0.000
		Lifetime smokers and e-cigarette users, no past month use	0.000	0.000	0.000
		Lifetime smokers, no past month use, without lifetime e-cigarette use history	0.000	0.000	0.000
		Anxiety sensitivity	0.129	0.484	0.000

	3: High negative, low positive expectancies	Current e-cigarette only users with lifetime cigarette smoking history	0.000	0.000	0.000
		Current e-cigarette only users without lifetime cigarette smoking history	0.000	0.000	0.000
		Current cigarette smokers, no past month e-cigarette use	0.000	0.000	0.000
		Dual-users	0.000	0.000	0.000
		Never users	0.000	0.000	0.000
		Lifetime smokers and e-cigarette users, no past month use	0.000	0.000	0.000
		Lifetime smokers, no past month use, without lifetime e-cigarette use history	0.000	0.000	0.000
		Anhedonia	0.160	0.660	0.034
1: Low negative and positive expectancies	2: Low negative, high positive expectancies	Anxiety sensitivity	0.551	2.066	0.053
	3: High negative, low positive expectancies	Anhedonia	0.134	0.580	0.002

Notes. A one unit increase in the predictor variable results in the estimated OR of being in the comparison class vs. the reference class. Redundant comparisons were excluded from the table. Dual users were defined as participants who endorsed use of traditional cigarettes and e-cigarettes in the past 30 days. Never users were defined as participants who denied ever using traditional cigarettes or e-cigarettes in their lifetime. Only findings significant at the $p < .05$ were included in this table.

CHAPTER 5

DISCUSSION

This investigator utilized a person-centered approach to derive profiles of young adults based on their beliefs about what it would be like to use e-cigarettes. Latent profile analysis revealed three distinct classes of young adults—namely, those with apathetic, positive, and negative views on e-cigarette use. As shown in Tables 5 and 6, clinically relevant features were used to predict group membership. Specifically, sex, education, race, anhedonia, anxiety sensitivity, and smoking status predicted participants' attitudes about e-cigarette use. Females, participants identifying as "other race", and participants with more years of education compared to less educated counterparts, were less likely to be grouped with those endorsing high positive e-cigarette outcome expectancies in comparison to those endorsing high negative and apathetic e-cigarette outcome expectancies. Participants identifying as Asian, Black, or White were less likely to endorse strong negative attitudes compared to apathetic responses toward e-cigarette use. Further, in comparison to the apathetic and positive groups, Asian and Black individuals were less likely to be grouped with those endorsing negative attitudes toward e-cigarette use.

In line with initial hypotheses, participants who endorsed decreased capacity to experience pleasure (i.e., high anhedonia) were less likely to endorse strong negative e-cigarette use outcome expectancies compared to positive or apathetic attitudes. Consistent with cigarette smoking and e-cigarette use literature, participants endorsing high anxiety sensitivity were more

likely to fit into the group endorsing high positive e-cigarette use outcome expectancies, including affect regulation (Johnson et al., 2008; Zvolensky et al., 2019a). These individuals were also less likely to fit in with the apathetic group compared to the positive or negative groups.

Regarding smoking status, predictive relationships were found for all participants besides former e-cigarette users without lifetime cigarette smoking history. Specifically, current e-cigarette users (regardless of traditional cigarette smoking history), current cigarette smokers, never users, former dual users and former smokers were less likely to be in the apathetic group compared to the positive or negative groups. These participants were also less likely to be in the negative group compared to the positive group. Current dual users were less likely to be in the apathetic or negative group compared to the positive group.

Overall, findings align with existing literature with some noteworthy differences that require continued exploration. Consistent with Leventhal and Zvolensky's (2015) transdiagnostic vulnerability framework for emotion-smoking comorbidity, anxiety sensitivity and anhedonia predicted young adults' membership in groups with similar expectations about using e-cigarettes. While the "Vape Positive" group had the lowest average distress tolerance scores compared to the other two groups, distress tolerance did not predict group membership. While further exploration is needed to understand the connection between distress tolerance and e-cigarette use, these findings reflect another preliminary investigation of this construct (Brockenberry, Braitman, & Harrell, 2022). Specifically, it appears that the relationship between perceived distress tolerance and e-cigarette outcome expectancies, at least as measured by self-report scales, is not as robust in comparison to the connection between anhedonia, anxiety sensitivity, and e-cigarette outcome expectancies in early adulthood.

The generalizability of these findings is limited by some methodological considerations. While conducting studies online has a number of benefits, some inherent limitations exist when using online survey data (Stritch, Pederson, & Taggart, 2017). For example, investigators were unable to verify accuracy of self-reported nicotine use via biomarkers. Still, this method of data collection has been used across a broad range of studies within addiction science, including in e-cigarette use investigations (Strickland & Stoops, 2019). While MTurk populations have been found to be more diverse than typical student samples (Buhrmester et al., 2011), they tend to be more educated and younger than the general population. This was reflected in our study's findings as the majority of participants were just over 30 years of age (M_{age} = 30.02; SD = 5.80) and endorsed having earned at least a Bachelor's degree.

While no differences in ethnicity were found in this study, only 10.5% of participants identified as Hispanic. This is not surprising as inconsistent findings have been reported regarding the association between ethnicity and e-cigarette use, likely due to variations in number of Hispanic participants in previous studies and cultural heterogeneity in the Hispanic population. Likewise, no differences in attitudes toward e-cigarette use were found across age groups. This may be attributable to ages of participants sampled since Boyle and colleagues (2019) found that those over age 25 tend to use e-cigarettes for cessation more often than emerging adults (aged 18-24).

This study is the first to assess young adults' e-cigarette outcome expectancies and emotion vulnerabilities using latent profile analysis among a sample with a diverse array of nicotine use histories. Despite outlined limitations, this investigation provides a useful look at emotional vulnerabilities to nicotine use and beliefs toward vaping among young adults. Since emotional vulnerabilities appear to impact a nicotine user's trajectory from initiation through

maintenance, it is important to understand all phases of this process to develop and deliver the best health practices. By having data that supports the connection between anhedonia, anxiety sensitivity, and e-cigarette outcome expectancies, clinicians will have a better understanding of how to direct individualized patient care. For example, honing skills to enhance deficits in identified areas, such as anhedonia and anxiety sensitivity, will bolster success in cessation attempts. Gaining a broad perspective on attitudes toward e-cigarette use can help practitioners tailor their approach to individual patients' needs in their journey toward abstinence. For heavy smokers with emotional vulnerability hoping to quit or cut down use, it is important that they understand the limitations of the use of e-cigarettes as a cessation tool, and instead, be presented with more clinically effective nicotine replacement options (e.g., nicotine patches, nicotine gum).

Further, this study revealed clearer distinctions between traditional cigarette and e-cigarette use outcome expectancy patterns. Specifically, distress tolerance appears less connected to e-cigarette outcome expectancies compared to traditional cigarette expectancies. Findings from this study also support that ongoing e-cigarette use research is warranted as these devices differ (e.g., in terms of efficiency of nicotine delivery, range of flavors available, etc.) compared to traditional cigarettes and differences have an impact on consumers' beliefs regarding use and ultimately, on their behavior. As Versella and colleagues (2019) aptly noted, differences in nicotine administration likely contribute to incongruent experiences among those who become dependent on nicotine products.

Finally, future studies should focus on the connections between emotion regulation, weight control, and aspects of diversity with e-cigarette use. This study was developed on the cusp of findings demonstrating statistical support for Pokhrel's e-cigarette outcome expectancy measure. Therefore, weight control was not included in the original statistical analysis plan.

Given support for this subscale and work demonstrating the importance of this variable (i.e., Pokhrel, Bennett, & Boushey, 2020), future research should incorporate an analysis of weight control. Considering that previous work has shown that these patterns may differ among non-White samples and across developmental periods, an increased understanding of these connections among more diverse samples will yield even more tailored clinical interventions. Therefore, expanding our understanding of these mechanisms among more diverse samples is worthy of attention.

In sum, results revealed that young adults' membership in e-cigarette use expectancy groups (e.g., groups with apathetic, positive and negative expectations about using e-cigarettes) were predicted based on key demographic features and malleable clinical opportunities for intervention. These groups are a useful first step for determining who is most likely to benefit from clinical prevention and intervention efforts. Our study confirmed the association between anxiety sensitivity, anhedonia, and e-cigarette outcome expectancies among young adults. Further, findings underscore unique e-cigarette use behavioral patterns which are distinct from traditional cigarette use and highlight the need for continued research to tailor best practices for nicotine use cessation.

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Zvolensky, M. J., Mayorga, N. A. & Garey, L. (2018). Worry, anxiety sensitivity, and electronic cigarettes among adults. *Psychiatry Research, 269*, 321-327. https://doi.org/10.1016/j.psychres.2018.08.087

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Zvolensky, M. J., Vujanovic, A. A., Bernstein, A., & Leyro, T. (2010). Distress tolerance: Theory, measurement, and relations to psychopathology. *Current Directions in Psychological Science, 19*(6), 406-410. https://doi.org/10.1177/0963721410388642

VITA

VICTORIA A. TORRES, M.A.

Doctoral Candidate, University of Mississippi

EDUCATION

2022 (anticipated)	Doctor of Philosophy in Clinical Psychology University of Mississippi, Oxford, MS Dissertation: *Latent profiles of young adults based on e-cigarette use outcome expectancies* Advisor: Lee M. Cohen, Ph.D.
2018	Master of Arts in Clinical Psychology University of Mississippi, Oxford, MS Thesis: *Predictors of behavioral health among firefighters in their third year of fire service* Advisor: Lee M. Cohen, Ph.D.
2014	Bachelor of Arts Baylor University, Waco, TX Major – Psychology; Minor – Child and Family Studies

CERTIFICATIONS

2020	Mississippi Department of Mental Health (DMH) Provisionally Certified Mental Health Therapist (PCMHT)
2019	Examination for the Professional Practice of Psychology ▪ *Passed at the Doctoral Level*
2018	Collaborative Institutional Training Initiative (CITI)

RESEARCH INTERESTS

- Health Psychology
  - Nicotine use
  - Social determinants of health for underserved groups
- Trauma and Resilience

PEER-REVIEWED PUBLICATIONS

1. **Torres, V. A.,** Ashford, J. M., Wright, E., Xu, J., Zhang, H., Merchant, T. E., & Conklin, H. M. (2021). The impact of socioeconomic status (SES) on cognitive outcomes following radiotherapy for pediatric brain tumors: A prospective, longitudinal trial. *Neuro-Oncology, 23*(7), 1173-1182. https://doi.org/10.1093/neuonc/noab018

2. Strack, J. E., **Torres, V. A.**, Pennington, M. L., Dupree, J., Cardenas, M., Dolan, S., Kruse, M. I., Synett, S. J., Kimbrel, N., Meyer, E., & Gulliver, S. B. (2021). Psychological distress and line-of-duty head injuries in firefighters. *Occupational Medicine, 71*(2), 99-104. https://doi.org/10.1093/occmed/kqab013

3. **Torres, V. A.,** Cohen, L. M., & Gulliver, S. B. (2020). Tobacco use disorder and its treatment. In C. S. Richards & L. Cohen (Eds.), *The Wiley Encyclopedia of Health Psychology* (Vol. 3). John Wiley & Sons, Inc.

4. **Torres, V. A.,** & Gulliver, S. B. (2020). Firefighters: An occupational case study of resilience. In Schulenberg, S. (Ed.), *Positive psychological approaches to disaster* (pp. 99-114). Springer. https://doi.org/10.1007/978-3-030-32007-2

5. **Torres, V. A.,** Pennington, M. L., Kruse, M., Kimbrel, N., Dolan, S., & Gulliver, S. B. (2020). Identifying frequency of mild traumatic brain injury (mTBI) in firefighters. *Workplace Health and Safety, 68*(10), 468-475. https://doi.org/10.1177/2165079920922576

6. Gulliver, S. B., Pennington, M. L., **Torres, V. A.**, Steffen, L. E., Mardikar, A., Leto, F., Ostiguy, W., Zimering, R. T., & Kimbrel, N. A. (2019). Behavioral health programs in fire service: Surveying access and preferences. *Psychological Services, 16*(2), 340-345. https://doi.org/10.1037/ser0000222

7. Pennington, M. L., Carpenter, T., Synett, S. J., **Torres, V. A.,** Teague, J., Morissette, S. B., Knight, J., Kamholz, B. W., Keane, T. M., Zimering, R. T., & Gulliver, S. B. (2018). The influence of exposure to natural disasters on depression and PTSD symptoms among firefighters. *Prehospital and Disaster Medicine, 33*(1), 102-108. https://doi.org/10.1017/S1049023X17007026

8. Sanford, K., Kruse, M. I., Proctor, A., **Torres, V. A.**, Pennington, M. L., Synett, S. J., & Gulliver, S. B. (2017). Couple resilience and life wellbeing in firefighters. *Journal of Positive Psychology*, *12*(6), 660-666. https://doi.org/10.1080/17439760.2017.1291852

9. Gulliver, S. B., Pennington, M. L., & **Torres, V. A.** (2017). Alcohol use disorder: Psychological factors. In A. Wenzel (Ed.), *The SAGE Encyclopedia of Abnormal and Clinical Psychology*. SAGE.

10. **Torres, V. A.**, Synett, S. J., Pennington, M. L., Kruse, M., Sanford, K., & Gulliver, S. B. (2016). The risks and rewards of marriage for fire fighters: A literature review with

implications for EAP. *EASNA Research Notes, 5,* 3. Available from: https://www.easna.org/wp-content/uploads/2010/08/EASNA-Research-Notes-Vol-5-No-3-August-2016.pdf

PAPER & POSTER PRESENTATIONS

1. Pavlacic, J. M., Weber, M. C., **Torres, V. A.**, Buchanan, E. M., & Schulenberg, S. E. (2021, November 18-21). *Trajectories of psychological functioning in international students during the COVID-19 pandemic* [Poster presentation]. Association for Behavioral and Cognitive Therapies 55th Annual Convention, New Orleans, LA, United States.

2. Weber, M. C., Pavlacic, J. M., **Torres, V. A.**, Schulenberg, S., & Buchanan, E. (2021, July 15-17). *Collective efficacy and accurate threat perception facilitate pandemic preparedness and prevention efforts among international students during COVID-19* [Paper presentation]. International Positive Psychology Association (IPPA) 7th World Congress, Vancouver, BC, Canada.

3. Pavlacic, J. M., Weber, M. C., **Torres, V. A.**, Schulenberg, S., & Buchanan, E. (2021, July 15-17). *It's never too late to start being resilient: A time-series study of social support and meaning in life among international students in the U.S. during the COVID-19 pandemic* [E-poster presentation]. International Positive Psychology Association (IPPA) 7th World Congress, Vancouver, BC, Canada.

4. Pavlacic, J. M., Weber, M. C., **Torres, V. A.**, Schulenberg, S. E., & Buchanan, E. M. (2020, July 12-15). *Trajectories of psychological functioning and pandemic preparedness for students quarantined during the COVID-19 pandemic* [E-poster presentation]. National Hazards Research and Applications 45th Annual Workshop, virtual.

5. Strack, J., **Torres, V. A.**, Pennington, M., Dupree, J., Cardenas, M., Gomez, D., Kimbrel, N., Dolan, S., Meyer, E., & Gulliver, S. B. (2020, May 21-24). *PTSD and depression symptoms in firefighters with line-of-duty head injuries* [Conference workshop]. Association for Psychological Sciences (APS) 32nd Annual Convention, Chicago, IL, United States.

6. **Torres, V. A.**, Ashford, J., Wright, E., Xu, J., Zhang, H., Merchant, T., & Conklin, H. M. (2020, February 5-8). *The impact of socioeconomic status (SES) on cognitive outcomes following radiotherapy for pediatric brain tumors: A prospective, longitudinal trial* [Poster presentation]. International Neuropsychological Society (INS) 48th Annual Convention, Denver, CO, United States.

7. Strack, J., **Torres, V. A.**, Coe, E., Pennington, M. L., Dupree, J., Dobani, F., Meyer, E. C., Gomez, D., & Gulliver, S. B. (2019, May 23-26). *Mild traumatic brain injuries and psychological distress in firefighters* [Poster presentation]. Association for Psychological Science (APS) 31st Annual Convention, Washington, DC, United States.

8. Gomez, D. R., **Torres, V. A.**, Thomason, P. M., Denman, T. C., Pennington, M. P., Maness, A. G., & Gulliver, S. B. (2017, November 9-11). *Sleep problems and posttraumatic stress disorder in fire service* [Poster presentation]. International Society for Traumatic Stress Studies (ISTSS) 33rd Annual Meeting, Chicago, IL, United States.

9. Gomez, D. R., **Torres, V. A.**, Thomason, P. M., Denman, T. C., Pennington, M. P., Maness, A. G., & Gulliver, S. B. (2017, April 14). *Sleep problems and posttraumatic stress disorder in fire service* [Poster presentation]. Baylor Scott & White Health Central Texas 5th Annual Research Day, Temple, TX, United States.

10. **Torres, V. A.**, Pennington, M. L., Kruse, M. I., Kimbrel, N., Dolan, S., & Gulliver, S. B. (2017, March 29 – April 1). *A first look at mild traumatic brain injury (mTBI) symptom frequency among U.S. firefighters* [Poster presentation]. Society of Behavioral Medicine (SBM) 38th Annual Meeting, San Diego, CA, United States.

11. Proctor, A., Sanford, K., Kruse, M., **Torres, V. A.**, Pennington, M. L., Synett, S. J., & Gulliver, S. B. (2015, November 12-15). *Dimensions of couple resiliency in a sample of firefighters* [Poster presentation]. Association for Behavioral and Cognitive Therapies (ABCT) 49th Annual Convention, Chicago, IL, United States.

12. Pennington, M. L., Synett, S. J., **Torres, V. A.**, & Gulliver, S. B. (2015, April 22-25). *Does exposure to natural disaster increase risk and vulnerability to health problems and depression in an at-risk population?* [Poster presentation]. Society of Behavioral Medicine (SBM) 36th Annual Meeting, San Antonio, TX, United States.

13. **Torres, V. A.**, Pennington, M. L., Synett, S. J., Kimbrel, N., & Gulliver, S. B. (2015, April 22-25). *Project reach out results: Who do firefighters try to help?* [Poster presentation]. Society of Behavioral Medicine (SBM) 36th Annual Meeting, San Antonio, TX, United States.

14. Gulliver, S. B., Pennington, M. L., **Torres, V. A.**, Synett, S., & Zimering, R. T. (2015, February). *Health risk behaviors in a risky profession: The tobacco and alcohol use of firefighters in their first years of service* [Poster presentation]. Society for Research on Nicotine and Tobacco (SRNT) 21st Annual Meeting, Philadelphia, PA, United States.

SCHOLARLY PRESENTATIONS

2019 *The Impact of Socioeconomic Status on Cognitive Outcomes of Brain Tumor Survivors*
St. Jude Children's Research Hospital Department Rounds
Memphis, TN

2018 *The Traumatized Resident with Intellectual Disabilities*
Baddour Center Staff Training
Senatobia, MS

IN PREPARATION

1. Pavlacic, J. M., Weber, M. C., **Torres, V. A.**, Ho, L. Y., Buchanan, E. M., & Schulenberg, S. E. (under review). Discrimination and protective factors predict trajectories of peri-pandemic growth and resilience for international students and their partners. *Journal of Abnormal Psychology.*

2. **Torres, V. A.**, Gross, A., Allen, M. T., Gulliver, S. B., & Cohen, L. (in preparation). Predictors of behavioral health among firefighters in their third year of fire service.

3. **Torres, V. A.** & Gulliver, S. B. Institutional betrayal and the disruption of meaning in emergency response. (under review). In J. Voss, P. Russo-Netzer & S. Schulenburg, (Eds.), COVID-19 and beyond (1st ed.) University Professors Press.

GRANT ACTIVITY

National Hazards Center Research Grant – Pavlacic, Torres, Weber (Co-PIs)
Title: *Trajectories of psychological functioning and pandemic preparedness for students quarantined during the COVID-19 pandemic*
Funding Period: 4/16/2020 – 12/18/2020
Total Direct Costs: $3,240
Role: Co-Principal Investigator

Baylor Scott & White Health Research Mentorship Award - Torres (PI)
Title: *Identifying frequency of mild traumatic brain injury (mTBI) in firefighters*
Funding Period: 10/16/2015 – 10/15/2016
Total Direct Costs: $880
Role: Principal Investigator

FEMA Fire Prevention & Safety Grant Award – Gulliver (PI)
Title: *Stamp out stigma: A national campaign to decrease stigma and increase behavioral health in fire service*
Funding Period: 7/31/2015 - 7/30/2017
Total Direct Costs: $1,394,953
Role: Research Technician

FEMA Fire Prevention & Safety Grant Award – Gulliver (PI)
Title: *In the wake of suicide: Evaluating standard operating procedure for postvention*
Funding Period: 7/8/2013 – 1/1/2015
Total Direct Costs: $639,362
Role: Research Technician

RESEARCH EXPERIENCE

2016 – 2021	Graduate Research Assistant, University of Mississippi Nicotine Use Laboratory Oxford, MS Supervisor: Lee Cohen, PhD
2018 – 2019	Research Assistant, St. Jude Children's Research Hospital Memphis, TN Supervisor: Heather Conklin, PhD
2016 – 2018	Research Assistant, University of Mississippi Contextual Psychology Laboratory Oxford, MS Supervisors: Kelly Wilson, PhD and Kate Kellum, PhD
2016 – 2017	Research Assistant, University of Mississippi Health and Anxiety Research and Treatment (HART) Laboratory Oxford, MS Supervisor: Laura J. Dixon, PhD
2014 – 2016	Research Assistant, Warriors Research Institute (WRI), Baylor Scott & White Health Waco, TX Supervisor: Suzy Bird Gulliver, PhD
2012 – 2015	Undergraduate Research Assistant, Baylor University Social Psychology Laboratory Waco, TX Supervisor: Jo-Ann Tsang, PhD
2013 – 2014	Undergraduate Research Assistant, Baylor University Mind Body Medicine Research Lab Waco, TX Supervisor: Gary Elkins, PhD

CLINICAL EXPERIENCE

2022 – Present Psychology Resident, San Antonio State Hospital (SASH)
San Antonio, TX
Supervisors: Steve Logsdon, PhD, Karen Conner, PhD, Heather Holder, PsyD, ABPP, Jessica Peterson, PhD

- Provided evidence-based individual and group therapy to patients.

- Assessed patients for competency to stand trial and dangerousness risk.
- Trained staff in borderline personality disorder and dialectical behavior therapy.

2021 – 2022 Psychology Resident, Transitional Care Clinic (TCC)
San Antonio, TX
Supervisors: David Roberts, PhD, Feiyu Li, PhD

- Provided evidence-based individual psychotherapy to patients discharged from hospital care.
- Co-led DBT Group and Mindfulness-Based Stress Reduction Group.
- Supervised counseling intern.

2020 – 2020 Therapist, Communicare
Oxford, MS
Supervisors: Scott Gustafson, PhD, ABPP, Dixie Church, LMFT

- Provided evidence-based individual psychotherapy to members of the surrounding community.

2017 – 2021 Graduate Trainee Therapist, Psychological Services Center (PSC)
University, MS
Supervisors: Laura J. Dixon, PhD, Scott Gustafson, PhD, ABPP, Danielle J. Maack, PhD, John Young, PhD

- Provided evidence-based interventions to adults, adolescents, and children in the community.
- Assessed therapeutic progress weekly using well-researched measures.

2017 – 2021 Psychological Examiner, Psychological Assessment Center (PAC)
University, MS
Supervisor: Scott Gustafson, PhD, ABPP

- Administered comprehensive psychological evaluations to assess for a variety of mental health diagnoses, learning disabilities, adaptive difficulties, and substance use disorders.
- Scored and interpreted assessment measures, wrote integrated reports, and presented feedback.

2019 – 2020 Graduate Clinician, University of Mississippi Counseling Center
University, MS
Supervisor: Michael Hirschel, PhD

- Provided evidence-based individual psychotherapy to undergraduate and graduate students.

2018 – 2019 Behavioral Health Consultant, Institute of Community Services
Head Start
Coldwater, MS; Holly Springs, MS
Supervisor: Alan M. Gross, PhD

- Observed 12 classrooms and developed child-specific functional behavior plans.
- Collaborated with pre-school teachers, families, social workers, and administrators to implement behavior plans.
- Supported teachers in effectively addressing classroom disruptive behavior.
- Provided referrals for evaluation of suspected cognitive, attentional, or developmental problems.

2017 – 2018 Education and Behavioral Support Intern, The Baddour Center
Senatobia, MS
Supervisor: Shannon Hill, PhD

- Provided evidence-based individual psychotherapy and assessment to adults with intellectual disabilities.
- Developed and implemented behavior plans.
- Provided weekly group social skills training.

2010 – 2011 Undergraduate Intern, Julianna Poor Memorial Counseling Center
Houston, TX
Supervisors: Greg Curnutte, MAMFC, LPC-S, Adam Mason, MAMFC, LPC-S, Huston McComb, Jr., MA, LPC-S

- Observed counseling sessions for adults and children.
- Coordinated a bilingual parenting workshop.

TEACHING AND MENTORING

Spring 2016 *Neurocognitive Disorders*
Guest lecturer at the University of Mississippi
Oxford, MS

Fall 2018 PSY 309 Learning
Teaching Assistant at the University of Mississippi
University, MS

Spring 2022 *Consultation in Multiple Settings*
Guest lecturer at Florida Tech
Virtual Presentation

CROSS-CULTURAL ENGAGEMENT

2021 Organizing Spanish-language consultation group for medical providers

2021 Guided discussion – *Best Practices: Working with Medical Interpreters*

2021	UT Health San Antonio - Diversity Equity and Inclusion (DEI) Committee Member

RELEVANT CLINICAL TRAINING

2022	STRONG STAR Training Initiative - Prolonged Exposure 2-day Virtual Workshop
2021	Dialectical Behavior Therapy Foundational Training Series
2021	Crisis Response Planning for Suicidal Patients
2020	Gottman Institute Training Series
2020	American Psychological Association's Telepsychology Best Practices 101 Series

MEMBERSHIP IN PROFESSIONAL ASSOCIATIONS

2022 - Present	National Latinx Psychological Association (NLPA)
2016 – Present	American Psychological Association (APA)
2020 – Present	Doctors for Change
2012 – 2014	Psi Chi National Honor Society in Psychology

ADDITIONAL RELEVANT SKILLS

- Spanish - Adequate verbal comprehension, limited functional speaking ability, ability to translate and back translate written materials

- Experience with the following research-related tools:
  - Amazon's Mechanical Turk (MTurk)
  - MPlus
  - Qualtrics
  - Statistical Package for the Social Sciences (SPSS)