Spring 5-2023

Predicting E-Cigarette Use Among Emerging Adults Using Perceived Social Norms and Outcome Expectancies

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Recommended Citation

PREDICTING E-CIGARETTE USE AMONG EMERGING ADULTS USING

PERCEIVED SOCIAL NORMS AND OUTCOME EXPECTANCIES

by

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B.S. May 2020, Virginia Commonwealth University

A Thesis Submitted to the Faculty of
Old Dominion University in Partial Fulfillment of the
Requirements for the Degree of

MASTER OF SCIENCE

PSYCHOLOGY

OLD DOMINION UNIVERSITY
May 2023

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ABSTRACT

PREDICTING E-CIGARETTE USE AMONG EMERGING ADULTS USING PERCEIVED
SOCIAL NORMS AND OUTCOME EXPECTANCIES

Stephen N. Hanson
Old Dominion University, 2022
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Despite low rates of combustible tobacco use rates among adolescents and young adults, e-cigarettes continue to gain popularity. A few factors have been shown to be related to e-cigarette use based on prior research. One such example is social enhancement expectancies. Additionally, greater perceptions of harm have been found to be inversely related to e-cigarette use such that those that expect increased risk to their health are less likely to report using e-cigarettes. I hypothesized that social enhancement expectancies would mediate the relationship between perceptions of social norms and e-cigarette dependence. I also hypothesized that perceived harm, such as greater perceived health risks, would moderate the indirect effect of perceived social norms and e-cigarette dependence. The same analyses were also examined with a dichotomous e-cigarette user status outcome variable. E-cigarette use status was determined based on past 30-day use of e-cigarettes. Analyses revealed that injunctive norms emerged as a significant predictor of both positive social outcome expectancies and e-cigarette user status. Perceived harm was also found to be a significant predictor of e-cigarette dependence. Further exploration of within group differences among e-cigarette users may be warranted in order to develop an intervention strategy tailored to this group.

This thesis is dedicated to:

My parents, Richard and Teresa, for continuing to push me to achieve my goals

My best friend and mother to my daughter, Stephanie, for being a consistent support system

My daughter, Maeleigh, for bringing joy to my life every day.

ACKNOWLEDGEMENTS

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CHAPTER I

INTRODUCTION

Rates of combustible tobacco use among youth and emerging adults is declining (Vogel et al., 2020), yet nicotine use continues to be high, and rates continue to increase in this population (Hajek et al., 2014). This increase appears to be due to the novelty/innovative nature of products that appeal to younger individuals (Mayorga et al., 2019). Specifically, whereas combustible tobacco products have a lifetime prevalence as low as 8.7% in this population, most reports of e-cigarette use among young adults and adolescents exceed 20% lifetime prevalence rates (Diez et al., 2019; Porter et al., 2015). E-cigarettes are devices that vaporize a solution containing nicotine and delivers vapor in a similar way to how a combustible tobacco cigarette can be smoked (Kong et al., 2015; Pokhrel et al., 2015). E-liquid is defined as a solution that is used in e-cigarettes that contains nicotine, flavorings, and propylene glycol/vegetable glycerin (Grana et al., 2014 Pokhrel et al., 2015;).

There are two types of social norms that are particularly influential in the decision-making process among young adults and adolescents (Lamblin et al., 2017). Injunctive social norms refer to the perception of a behavior being more socially normal by peers and others. In contrast, descriptive norms are the perceived prevalence of a target behavior (i.e., e-cigarette use) in a given population. Research has shown that injunctive norms are one of the most salient factors relating to e-cigarette use (Jha & Kraguljac, 2021). In addition to injunctive norms, social enhancement expectancies have been found to be associated to e-cigarette use (Pokhrel et al., 2015). Social enhancement expectancies are social outcomes expected to result from engaging in

a behavior (Pokhrel et al., 2014), and positive social enhancement expectancies imply that individuals expect to gain some social capital (i.e., look cool, gain respect, etc.) or be seen in a more positive light by peers and friends when engaging in the behavior. Finally, perceived harm has also been associated with increased e-cigarette use in young adult populations (Laurene et al., 2019). Nicotine is an addictive central nervous system stimulant (National Center for Biotechnology Information, 2021), so it is important to understand how perceived injunctive social norms, positive social enhancement expectancies, and perceived harm can uniquely influence e-cigarette use and dependence. Therefore, the purpose of this study was to examine the influence of perceived injunctive norms and social enhancement expectancies on e-cigarette use and dependence among an emerging adult population. In addition, I examined the moderating effect of perceived e-cigarette harm on the relationship between positive social enhancement expectancies and e-cigarette use/dependence.

The conventional exploration model (CEM; Ritt-Olsen et al., 2004) asserts that individuals who value their health will be less likely to engage in behaviors that may put their health at risk. Based on this assertion, the conventional exploration model would suggest that individuals who perceive greater levels of harm from e-cigarettes would be less likely to use them or use them heavily. Conversely, Wills et al. (2015) suggested that health-conscious users likely have fewer deviant tendencies. This study implies that individuals who perceive higher levels of acceptability of e-cigarettes among peers (i.e., higher levels of injunctive norms) are in turn, more likely to use e-cigarettes so long as they perceive lower harm (i.e., health conscious). Therefore, I hypothesized that individuals with elevated injunctive norms would be more likely to have increased e-cigarette use as well as e-cigarette dependence.

Similarly, Coleman et al. (2016) found that various positive beliefs toward e-cigarettes, such as social enhancement expectancies, were often a result of perceiving e-cigarettes to be more socially normal (i.e., elevated injunctive norms). This research implies that if one perceives e-cigarette use to be more socially normal (i.e., elevated injunctive norms), it is likely that they also would perceive greater positive social enhancement expectancies and are more likely to engage in heavier use. Therefore, I hypothesized that increased perceptions of e-cigarettes as socially acceptable (i.e., elevated injunctive social norms) would be associated with increased positive social enhancement expectancies.

In addition to examining specific components of the conventional exploration model, aspects from the health belief model (HBM) were also included in the model. The key constructs examined from the Health Belief Model are perceived severity and perceived benefits (Glanz et al., 2015). The HBM would suggest that perceived benefits (i.e., positive social enhancement expectancies) and perceived severity (i.e., or the perceived lack of harm) have a substantial influence on e-cigarette use. In addition, perceived risk and harm may interact with, or moderate one another, such that if perceived severity outweighs perceived benefits, then the influence of perceived benefits on an individual's behavior will be reduced (Glanz et al.). Therefore, I hypothesized that perceived harm would moderate the relationship between positive social enhancement expectancies and e-cigarette use, such that the link between positive social enhancement expectancies and e-cigarette use and dependence would become weaker as perceived harm increased.

LITERATURE REVIEW

Health Risks for E-tobacco Products

Youth and young adults tend to harbor many misconceptions about e-cigarette use; specifically, that there are no adverse consequences associated with use. In fact, many e-cigarette users believe that e-cigarettes hold no health risks (Roditis & Halpern-Felsher, 2015). Moreover, there is a lack of understanding of nicotine labels on e-liquids (Morean et al., 2021), and many users think that e-cigarettes produce a harmless water vapor (Roditis & Halpern-Felsher). When a sample of 159 e-liquids were examined in a lab setting, diacetyl or acetyl propionyl, common flavoring agents that have been associated with lung diseases, were detected in 45.9% of samples (Farsalinos et al., 2015). Of the e-liquid samples that contained diacetyl, 47.3% of these contained levels of diacetyl that would exceed National Institute for Occupational Safety and Health (NIOSH) standards. Moreover, 41.5% of the samples containing acetyl propionyl would also expose users to higher levels than the NIOSH limit. Both flavoring agents are considered to be safe for consumption; however, these substances have not been deemed safe for inhalation (National Institute for Occupational Safety and Health, 2011). When ingested via inhalation, both substances have been found to be related to bronchiolitis obliterans, which is irreversible, as well as reduced forced expiratory volume (Farsalinos et al.). Forced expiratory volume is an important metric that is commonly used for lung disease diagnosis referring to the amount exhaled during a forced breath (Healthwise, 2020), and bronchiolitis obliterans is a disease in which inflammation and scarring of lung tissue may cause blocked airways (Genetic and Rare Diseases Information Center, 2016). Early incidence of severe long-term health problems would likely lead to increased expenditure in public health as well as labor force dollars lost in addition to the other factors comorbid with chronic health conditions.

In addition, users often fail to understand the nicotine concentration label that is found on an e-cigarette or e-liquid label (Morean et al., 2021). Not only are labels often misunderstood, but participants also frequently misconstrued concentrations presented in mg/ml by assuming that these concentrations were more harmful than the equivalent concentration presented to individuals in percent nicotine concentration (Morean et al.). E-cigarette products can contain similar or elevated nicotine delivery profiles to traditional combustible cigarettes (Marsot & Simon, 2015), which can rapidly lead to nicotine dependence (Morean et al., 2019). Therefore, both e-cigarette use as well as dependence were examined as the primary outcome variables in this study.

Injunctive Social Norms

Researchers have found a robust relationship between peer influences and nicotine use behaviors (Fadus et al., 2019; Kong et al., 2015). Noland et al. (2016) conducted a study in which perceived injunctive social norms and perceived levels of peer use of tobacco products were compared in a college sample. The authors examined cigarettes, e-cigarettes, and hookah in their analysis and found that regular tobacco users reported a higher number of other tobacco users in their life as well as more frequent exposure to tobacco products. E-cigarette users in this study reported substantially more siblings, family members, and/or close friends who used e-cigarettes as compared to non-users. Gorukanti et al. (2017) found that when comparing e-cigarette users to non-users, e-cigarette users perceived use to be more socially normal than non-users (i.e., higher injunctive norms).

Given the use of social media as a means for socialization and obtaining social information, researchers have also explored social media as it relates to e-cigarette use behaviors. Findings suggest that time spent using social media was associated with increased perceived

injunctive social norms (Vogel et al., 2020), such that participants who spent more time on social media believed e-cigarettes to be more socially acceptable. The authors suggest this finding is likely due to heightened exposure to e-cigarette content via social media applications. Vogel et al. also found that posts about e-cigarette use were more salient when posts were peer generated. In other words, posts that appeared to be from peers were more influential in increasing injunctive norms for participants. Further, when conducting a narrative review, Fadus et al. (2019) found evidence that some of the most influential factors in experimentation with e-cigarettes and e-cigarette use were various social factors such as injunctive social norms.

The CEM suggests that one should not want to deviate from perceived injunctive social norms, and therefore may be more likely to engage in e-cigarette use as long as injunctive norm perceptions are high. As noted above, social influences, including social media, have been associated with higher levels of positive outcome expectancies in participants (Pokhrel et al., 2018). Positive outcome expectancies include multiple domains such as affect regulation, positive sensory experience, and social enhancement. E-cigarette users often report heightened perceptions of social norms via exposure to e-cigarettes (Gorukanti et al., 2017, Noland et al., 2016), which in turn is directly associated with positive social outcome expectancies (Pokhrel et al.). This would suggest a link between injunctive social norms and positive social enhancement expectancies, both of which are often associated with e-cigarette use.

Social Enhancement Expectancies

In addition to injunctive social norms, users often report that social enhancement expectancies are a primary reason for engaging in use of e-cigarettes (Fadus et al., 2019; Pokhrel et al., 2015). Having positive outcome expectancies, such as social enhancement, has not only been associated with e-cigarette use generally, but has also been associated with heavier use

(Doran & Brikmanis, 2016). Barker et al. (2019) examined various positive outcome expectancies and the influence that these may have on e-cigarette use. These authors found that all positive outcome expectancies, including social enhancement expectancies, were related to a greater likelihood of an individual engaging in e-cigarette use. In addition, research has shown that individuals who report being daily e-cigarette users also reported greater benefits as an outcome of e-cigarette use when compared to non-users and non-daily users (Mayorga et al., 2019). Positive social enhancement expectancies can be considered a benefit to use of e-cigarettes therefore this suggests that positive social outcome expectancies may play a role in not only e-cigarette use, but also heavier use among those who report being users. This explains findings from Doran and Brikmanis who found that social enhancement expectancies are in fact related to heavier use of e-cigarettes.

The above studies suggest that individuals who perceive e-cigarettes to be more socially normal (i.e., elevated injunctive norms) may lead to higher expectations for positive outcome expectancies, such as social enhancement. As such, I hypothesized that elevated injunctive social norms would be positively associated with increased social enhancement expectancies. In addition, the aforementioned research suggests that positive social enhancement expectancies may positively predict e-cigarettes use as well as dependence, such that heightened positive social enhancement expectancies should predict a higher likelihood for one to engage in e-cigarette use as well as heavier dependence. Therefore, I hypothesized that positive social enhancement expectancies would mediate the relationship between perceived injunctive social norms and e-cigarette use and dependence, such that increased perception of e-cigarettes as socially normal would predict increased social enhancement expectancies, which in turn would predict use and dependence (see Figure 1).

Perceived Harm

The increasing popularity of e-cigarettes among young adults has been found to be, in part, due to the perception of decreased health risks, or lower perceived harm, when compared to traditional combustible products such as cigars or cigarettes (Gorukanti, 2017; Pokhrel, et al., 2015). Perceived harm includes the perception of negative health consequences, such as heart disease or lung cancer, as well as risk of addiction from using e-tobacco products (Park et al. 2019; Pokhrel et al. 2015). Among young adults who do not use tobacco products, qualitative research suggests that health concerns and risk of addiction are commonly cited as reasons for not using e-cigarettes (Barker et al., 2019; Mayorga et al., 2019; Pokhrel et al., 2015). However, when comparing e-cigarette users to non-users, e-cigarette users commonly cite reduced health risks as a reason for preferring e-cigarettes to combustible products (Hershberger et al., 2017). In addition, another study found as many as 60% of current users believed that e-cigarettes were not harmful (Anand et al., 2015). As such, I expected increased perceived harm to also predict reduced e-cigarette use and therefore dependence.

Researchers have also examined the role of perceived harm in e-cigarette prevention efforts. Wilson et al. (2019) found that non-users of e-cigarettes endorsed higher levels of perceived harm for e-tobacco products with regards to development of terminal illnesses, such as cancer, as well as the general safety of the e-cigarette devices. Further, higher levels of perceived risk of heart disease, risk of harm, and risk of addiction are associated with greater odds of not using e-cigarettes (Laurene et al., 2019). Although these studies do provide evidence that perceived harm may act as a strong deterrent to using e-cigarettes, they have not directly assessed the role of perceived harm among current users. To address this deficiency, one study examined perceived harm among non-users as well as exclusive e-cigarette users, meaning

individuals that only use e-cigarettes and no other tobacco/nicotine products. The researchers found that exclusive users were more than three times as likely to report that e-cigarettes posed little to no harm at all (Cooper et al., 2017). These studies suggest that perceived harm plays an important role in e-cigarette use patterns, such that individuals who perceive more harm are less likely to engage in e-cigarette use and that individuals who do use e-cigarettes are perhaps unaware of the risks that these products impose.

Additionally, these studies suggest that individuals engage in the use of e-cigarettes with different frequencies depending on the level of perceived harm of using e-cigarettes. According to the HBM, it has been suggested that perceived benefits and perceived barriers can interact, such that perceived benefits may only exert a strong influence when low levels of perceived barriers exist (Glanz et al., 2015). However, when perceptions of perceived barriers are high, perceived benefits may become less influential. Therefore, I hypothesized that perceived harm would moderate the indirect effect of perceived social norms, such that relationship between social enhancement expectancies and with-cigarette use and dependence would become weaker as perceived harm from e-cigarettes increases.

The current research examined positive social enhancement expectancies as a mediating factor in the association between perceived injunctive social norms and e-cigarette use and dependence. I expected that increased injunctive norms would predict higher levels of positive social enhancement expectancies, leading to a higher likelihood of use as well as higher levels of dependence. Further, I examined if the relationship between social enhancement expectancies and e-cigarette use and dependence changes as a function of perceived harm (i.e., moderation; see Figure 2). Specifically, I expected that the relationship between positive social enhancement expectancies and e-cigarette use and dependence would vary as a function of perceived harm

from e-cigarettes, such that the links between social enhancement expectancies and e-cigarette use / dependence would become weaker at higher levels of perceived harm.

Prior research suggests that perceived injunctive social norms as well as positive social enhancement expectancies are associated with e-cigarette use (Fadus et al., 2019; Noland et al., 2016). This is a robust finding in the literature; however, researchers have yet to examine whether perceived harm may play a moderating role in predicting e-cigarette use and dependence. Research indicates that higher levels of perceived harm are associated with reduced levels of use (Wilson et al., 2019), and lower levels of perceived harm may be associated with increased e-cigarette use (Cooper et al., 2017). Understanding the influence of these factors on e-cigarette use as well as e-cigarette dependence could be vital in education efforts to reduce health risks imposed by e-cigarettes and reduce incidence of chronic disease associated with e-cigarettes.

Understanding the influence of these factors on e-cigarette use as well as e-cigarette dependence could be vital in education efforts to reduce health risks imposed by e-cigarettes and reduce incidence of chronic disease associated with e-cigarettes. Research has shown that many e-cigarette users believe that e-cigarettes produce nothing more than a harmless water vapor (Roditis and Halpern-Felsher, 2015). Despite this belief, it has been shown that many e-liquids that are used in e-cigarettes contain dangerous amounts of compounds that are known to cause chronic lung illnesses (Farsalinos et al., 2015). Therefore, it is vital to explore various mechanisms and interactions that may influence e-cigarette use and dependence in order to mitigate the risks that e-cigarettes pose for users.

The hypotheses for this study pertain to both e-cigarette users and non-users. Hypotheses related to user status (i.e., user vs. non-user) examined data collected from both e-cigarette users

and non-users alike. In contrast, hypotheses pertaining to e-cigarette dependence used data from only e-cigarette users. In summary, the hypotheses are as follows:

General Hypotheses

H1: Greater perceptions of injunctive norms regarding e-cigarette use would predict higher levels of positive social enhancement expectancies.

E-cigarette Use Hypotheses

H2: A significant direct effect of injunctive norms on e-cigarette use was expected when controlling for social enhancement expectancies, such that higher perceptions of injunctive norms would predict higher odds of endorsing e-cigarette use.

H3: Among all participants, it was hypothesized that higher levels of positive social enhancement expectancies would predict greater odds of being an e-cigarette user vs. non-user when controlling for perceived injunctive social norms.

H4: Consequently, it was hypothesized that positive social enhancement expectancies would mediate the relationship between perceived injunctive social norms and e-cigarette use, such that perceived social norms should predict higher levels of positive social enhancement expectancies, which would then predict higher odds of e-cigarette use.

H5: Finally, among all participants, it was hypothesized that perceived harm and positive social enhancement expectancies would interact, such that the prediction of use status from positive social enhancement expectancies would become weaker as perceived harm increases.

E-cigarette Dependence Hypotheses

H6: Among e-cigarette users only, it was hypothesized that higher perceptions of injunctive norms would predict higher levels of e-cigarette dependence when controlling for social enhancement expectancies.

H7: Among e-cigarette users, it was expected that higher levels of positive social enhancement expectancies would predict higher levels of dependence when controlling for perceived injunctive social norms.

H8: Additionally, it was expected that positive social enhancement expectancies would mediate the relationship between perceived injunctive norms and e-cigarette dependence, such that perceived injunctive norms should predict higher levels of positive social enhancement expectancies, which in turn should predict higher levels of e-cigarette dependence.

H9: Finally, it was hypothesized that perceived harm would moderate the indirect effect between perceived injunctive norms and e-cigarette dependence, such that the positive social enhancement expectancies relationship with e-cigarette dependence should become weaker as levels of perceived harm increases.

CHAPTER II

METHOD

PARTICIPANTS AND PROCEDURE

For this study participants were recruited from an undergraduate psychology research pool as well as through university announcements. All measures were administered online in a self-report fashion by using an anonymous, Qualtrics survey. The target population was emerging adults; specifically, individuals for this study were between 18 and 25 years of age. Using a psychological research pool and university announcements for recruitment at a large state university in the southeast United States allowed us to examine this population by collecting cross-sectional data. Table 1 lists the descriptive statistics for the study. Participants ranged in age from 18-25 ($M = 20.32$, $SD = 1.77$). Participants reported their gender identity as 73.9% woman ($n = 178$), 22.8% man ($n = 55$), 0.8% ($n = 2$) identified as gender queer/non-conforming, 1.2% ($n = 3$) identified as nonbinary, 0.4 ($n = 1$) identified as other and 0.4% ($n = 1$) preferred to not answer (see Table 1). Participants reported their biological sex as well, such that there were 75.9% ($n = 183$) females and 22.8% ($n = 55$) males, with the remainder of the sample opting to not answer. The sample was also racially diverse: White (44.8%, $n = 108$), African American (33.6%, $n = 81$), Asian (7.5%, $n = 18$), Native Hawaiian/Pacific Islander (1.2%, $n = 3$), American Indian or Alaska Native (0.4%, $n = 1$), and those that identified as another race (12.0%, $n = 29$).

Participants who were recruited from university announcements were entered into a raffle for the chance to win one of two amazon e-gift cards each with a value of $50. Participants

who were recruited via a psychology research pool were compensated with research credit. Once beginning study procedures, participants were asked to complete all study measures in one sitting.

However, not all participants were able to be included in the final analytic sample due to failure to meet various inclusion criteria or meeting exclusion criteria. Data from 32 subjects were excluded as they were not in the targeted age range (16 were over age 25, 15 did not report age, and 1 was under age 18). Additionally, data from all participants who finished study measures in under 5 minutes ($n = 61$) were not included in the analysis. Data from these participants were deleted from the final analytic sample due to having been more than one standard deviation less than the mean amount of time taken (minutes $M = 28.54$, $SD = 16.78$). Last, participants who completed less than 50% of study measures were not included in the final analyses, resulting in a loss of 16 participants.

Missing data were then examined. Overall missingness was high at 23.28%, which was due to an error in the electronic delivery of the surveys. Specifically, a sliding bar was used for a continuous rating scale with anchors being at 1 and 10. If participants did not click on the sliding bar (i.e., left it at the default value of 1), Qualtrics coded the response as missing. This means that there was no way to distinguish between missing data or a true 1 on the scale. This prompted the removal of 221 participants because researchers were unable to distinguish between a '1' and missing data. After addressing the error, overall missingness was very low at under 5%, and no patterns in missing data were present. The final analytic sample consisted of 241 college students.

MEASURES

Prior to administration of any scale, a definition for e-cigarettes was provided to participants: "E-cigarettes are devices that are used to vaporize a solution containing nicotine that delivers vapor in a similar way to how a combustible tobacco cigarette can be smoked. This includes vaping mods, pod devices (e.g., JUUL), and disposable devices (e.g., Puffbar, C4)".

E-cigarette use

E-cigarette use was measured via multiple items created for this study. Participants were asked if they have ever used e-cigarettes. Response options included never, more than 30 days ago, and during the last 30 days. Participants who indicated they had used more than 30 days ago were asked to report their last use. Participants that indicated having used e-cigarettes in the last 30 days were given the following question: "During the past 30 days, on how many days did you use e-cigarettes?" (Giovenco et al., 2014). Participants who indicated having used e-cigarettes on one or more occasions during the past 30 days were coded as being current users, and only those who indicated having not never used e-cigarettes were categorized as non-users.

E-cigarette Dependence

E-cigarette dependence measures were only given to participants that met the criteria for being considered a current e-cigarette user. E-cigarette dependence was measured using the E-cigarette Dependence Scale (EDS; Morean et al., 2019). Morean et al. adapted this scale from the patient-reported outcomes measurement information system (PROMIS) scale (Edelen et al., 2014; Edelen et al., 2016; Shadel et al., 2014). This scale includes 22 items that assess the level of nicotine dependence. Items are rated on a five-point, Likert-type scale from 0 (Never) to 4 (Almost always). This scale has demonstrated good internal consistency, with authors finding a Cronbach's alpha value of .98. Validity was established for this scale by using bivariate

correlations with the Penn State electronic cigarette dependence index (PSECDI), both the ten

item PSECDI, $r = .70$, and the nine item PSECDI, $r = .78$ (Foulds et al., 2015). Scoring for this

scale was done by creating a composite score summing across all items with higher scores

indicating higher levels of dependence. Example items on this scale include "I find myself

reaching for my e-cigarette without thinking about it," and "When I go too long without vaping, I

get strong urges that are hard to get rid of."

Injunctive Norms for E-cigarettes

Injunctive social norms were measured using a scale of various social cognitive

predictors of smoking initiation (Hansen et al., 2007) adapted for use with e-cigarettes. This

scale assesses social cognitive predictors with subscales for self-efficacy, social influence

behavior, social influence norms, social influence pressure, and attitudes. The subscale of interest

for this study was the social norms influence scale. The social norms influence scale is

comprised of 4 items that in which participants are asked to rate how parents, professors

(changed from "teachers" on the original measure to tailor to the target age group), peers, and

friends would feel about their use of vaping/e-cigarette products. In adapting this scale,

participants were also asked about how significant others, coworkers, and siblings would feel

about their use of nicotine products. This adaptation resulted in this scale containing 7 items

instead of 4. Ratings were assessed using a Likert-type scale response options: 0) "Think that it

is OK if I smoke," 1) "Don't care if I smoke or not", and 2) "Don't think that I should smoke".

Participants were also presented with an answer choice of "Don't know/Not applicable". An

overall score was developed by average of the item scores for all 7 items. Higher scores

correspond with lower levels of support for e-cigarette/vaping. In order to assess scale fit,

Hansen et al. fit various indexes to a standard Rasch model in order to assess validity and ensure

unidimensionality of each subscale thereby establishing evidence for convergent validity. The authors determined that all items included in the social influence norms subscale converged onto a single factor establishing sufficient evidence for convergent validity of the subscale. In addition, they found that the social influence norm subscale demonstrated suitable internal consistency with a Cronbach's alpha of .74.

Positive Social Enhancement Expectancies

Positive social enhancement expectancies were measured with the E-cigarette smoking outcome expectancies measure (ESOEM; Pokhrel et al., 2014). Social enhancement expectancies are one of several domains included in outcome expectancies. Pokhrel et al. defines outcome expectancies as outcomes expected to result from engaging in a behavior. When applying this definition to social enhancement expectancies, this is the expectation of enhancing one's social status or gaining social capital as a result of engaging in a specified behavior. For the purpose of this study, e-cigarette use was the target behavior for this scale.

Participants were presented with the prompt "If I use e-cigarettes, I expect to…" followed by the ten items included in this scale. Example items from the social enhancement subscale include "Gain respect of friends," and "Become more popular." There are a total of 10 items in the social enhancement subscale. Participants responded to all items on a continuous rating scale ranging in values from 1-10 with a value of 1 being "not at all likely" and 10 being "extremely likely". Scores for each item were averaged in order to create a composite score with higher scores on this scale indicative of more positive outcome expectancies. The social enhancement subscale had a Cronbach's alpha of .94, indicating a high level of internal consistency. The author states that good construct validity could be observed for all extracted expectancy factors presented in this scale (Pokhrel et al., 2014).

Perceived Harm of E-cigarettes

Perceived harm of e-cigarettes was measured using a perceived harm scale developed by Waters et al. (2017). This scale contains a total of five items that directly assess perceived harm of e-cigarettes (e.g., "E-cigarette use takes years off of my life," and "Using e-cigarettes risks heart disease."). Items are rated on a nine-point, Likert-type scale ranging from 1 (strongly disagree) to 9 (strongly agree). This scale demonstrated a high level of internal consistency with a Cronbach's alpha of .93. Scoring for this scale was done by taking an average of all five items, with higher scores indicating greater perceived harm from e-cigarettes.

CHAPTER III

RESULTS

DESCRPITIVE STATISTICS

Participants were categorized into one of two user status groups based on past 30-day e-cigarette use. Participants that indicated use of e-cigarettes on one or more occasion over the past 30 days were coded as current users and participants that did not endorse past 30-day use were coded as non-users. There were 49 e-cigarette users and 192 non-users. Those that were categorized as e-cigarette users were also given a measure of e-cigarette dependence ($M = 30.00$, $SD = 27.49$). Additionally, participants were given measures of injunctive norms ($M = 1.43$, $SD = 0.53$), social outcome expectancies ($M = 2.81$ $SD = 1.86$), and perceived harm ($M = 7.40$ $SD = 1.74$).

Correlations among the primary study variables and Cronbach's alphas are listed in Table 2. Notably, e-cigarette use exhibited trends in line with the hypotheses for this study, such that e-cigarette user status showed a negative correlation with injunctive norms ($R = -.307$, $p < .001$), a positive correlational trend with social enhancement expectancies ($R = .089$, $p = .083$), and a negative correlation with perceived harm ($R = -.135$, $p = .018$). Despite the lack of significance, the correlation between e-cigarette use and social enhancement expectancies was in the direction hypothesized. Additionally, correlations were examined among e-cigarette dependence and the primary study variables. E-cigarette dependence was negatively correlated with social enhancement expectancies ($R = -.108$, $p = .231$), negatively correlated with injunctive norms (R

= -.193, p = .092) and positively correlated with perceived harm (R = .282, p = .025). Only perceived harm was significantly correlated with e-cigarette dependence.

Prior to hypothesis testing, regression assumptions were examined. Normality was confirmed via a Q-Q plot. Tolerance was examined to ensure multicollinearity was acceptable; no regressors had a tolerance below .889, which indicates multicollinearity was not present. Scatterplots with imposed loess lines confirmed homoscedasticity. Finally, Cook's D estimates were obtained to ensure no individual had too much influence on the overall analyses. A minimum of .000 and maximum of .522 indicated no issues with multivariate outliers.

HYPOTHESIS TESTING

Hypothesis 1 stated that greater perceptions of injunctive norms would predict higher levels of positive social outcome expectancies. To examine this hypothesis, a linear regression testing the direct effect of injunctive norms on social outcome expectancies was conducted. The result of this regression examining the relationship between injunctive norms and positive social outcome expectancies was significant, such that a significant negative relationship between injunctive norms and social outcome expectancies was detected providing support for the first hypothesis, $t(240)$ = -3.44, p < .001, R^2 = .047. This result indicates that 4.7% of the variance in social enhancement expectancies can be explained by injunctive norms. Because higher scores on the injunctive norms measure indicates that the perception of e-cigarettes are less socially acceptable (i.e., reverse-coded), this suggests that when support for e-cigarette use was lower, positive social outcome expectancies decreased. Specifically, when participants perceived e-cigarettes as less socially acceptable, they tended to report that e-cigarette use would have less positive social impact.

A logistic conditional indirect effects model was used to test Hypotheses 2-5 (see Figure 2), where the primary dependent variable was e-cigarette use (dichotomized as user or non-user). Hypothesis 2 stated that injunctive norms would positively predict e-cigarette use, and Hypothesis 3 stated that positive social outcome expectancies would also positively predict e-cigarette use. Hypothesis 4 asserted that positive social outcome expectancies would mediate the relationship between injunctive norms and e-cigarette use. Last, Hypothesis 5 examined the entire indirect effects model by examining perceived harm as a moderator of the 'b' pathway, thereby moderating the relationship between positive social outcome expectancies and e-cigarette use. Specifically, it was predicted that increased perceived harm would weaken the relationship between social outcome expectancies and e-cigarette use.

All predictor variables were grand-mean centered before running the conditional indirect effects model. Five thousand bootstrapped samples were estimated via percentile bootstrapping to create 95% confidence intervals. Results are listed in Table 3 and standardized results are depicted in Figure 3. The estimated intercept was a logit of -1.49, which suggests that when all predictor variables are at their mean, there is an 18% probability that an individual will endorse being a current e-cigarette user (b = -1.49, p < .001, 95% CI [-1.85, -1.13]). Results also demonstrate a significant negative relationship between perceived injunctive norms and e-cigarette use status, (b = -1.36, p < .001, 95% CI [-1.99, -0.72]), which suggests that for a one unit increase in injunctive norms (i.e., perceived as less socially acceptable) a decrease of 1.36 logits for endorsing current e-cigarette use can be expected while holding other predictors at their mean. The corresponding odds ratio for this decrease is 0.26, which indicates that the probability of endorsing current e-cigarette use drops by 74% as injunctive norms increase by one unit. This odds ratio is associated with a probability of endorsing current e-cigarette use of 5% as compared

to a probability of 18% when all other variables in the model are at their mean. This finding confirms Hypothesis 2.

Hypothesis 3 examined the direct relationship between social enhancement expectancies and e-cigarette use. This hypothesis was not supported (b = 0.03, *p* = .755, 95% CI [-0.16, 0. 21]), which indicates that for a one unit increase in social enhancement expectancies, an increase of 0.03 logits for endorsing current e-cigarette use can be expected when holding other predictors at their mean.

Hypothesis 4 examined the indirect effect of injunctive norms on e-cigarette user status through social enhancement expectancies. There was no evidence of mediation (indirect b = - 0.02, 95% CI [-0.17, 0.13]); thus, Hypothesis 4 was not supported. Finally, Hypothesis 5 was examined, which involved the interaction between perceived harm and outcome expectancies. The interaction between perceived harm and positive social outcome expectancies was not significant (b = -0.05, 95% CI [-0.15, 0.02]); thus, Hypothesis 5 was not supported.

Subsequent hypotheses concerning e-cigarette dependence were examined using only e-cigarette users (N = 49). Hypothesis 6 stated that a significant positive direct effect would be observed between injunctive norms and e-cigarette dependence. Hypothesis 7 was that positive social enhancement expectancies would positively predict higher levels of dependence, and Hypothesis 8 was that positive social enhancement expectancies would mediate the relationship between injunctive norms and e-cigarette dependence. Finally, Hypothesis 9 examined the moderating effect of perceived harm on social enhancement expectancies (see Figure 2).

Similar to the first conditional indirect effects model looking at use status, 5000 percentile bootstrapped samples were used to create 95% confidence interval and all predictors

were grand-mean centered. The dependent variable was e-cigarette dependence. Results are listed in Table 4 and standardized results are depicted in Figure 4.

The overall model examining Hypotheses 6-9 was not significant, $F(4,44) = 1.66$, $R^2 = .13$, $p = .177$ Hypothesis 6 was not supported, (b = -9.49, $p = .174$, 95% CI [-23.32, 4.33]), such that there was not a significant relationship between injunctive norms and e-cigarette dependence. Additionally, Hypothesis 7 was not supported because the relationship between positive social enhancement expectancies and e-cigarette dependence was not significant, (b = -1.27, $p = .623$, 95% CI [-6.45, 3.91]). Hypothesis 8 examined the mediating effect of social enhancement expectancies on the relationship between injunctive norms and e-cigarette dependence. The indirect effect was not significant, (indirect b = -0.06, 95% CI [-2.42, 2.53]), which indicates that social enhancement expectancies did not mediate the relationship between injunctive norms and e-cigarette dependence; hypothesis 8 was not supported. Hypothesis 9 examined the moderating effect of perceived harm on the relationship between social enhancement expectancies on e-cigarette dependence. Contrary to hypotheses, the interaction was not significant, (b = -0.12, 95% CI [-1.84, 1.83]); thus, Hypothesis 9 was not supported. Finally, there was a significant, positive direct effect of perceived harm on e-cigarette dependence, (b = 6.16, $p = .047$, 95% CI [0.08, 12.23]), which indicates that as levels of perceived harm increase, ratings of e-cigarette dependence also increase.

CHAPTER IV

DISCUSSION

For the present study, two conditional indirect effect models that were based upon the CEM (Ritt-Olsen et al., 2004) as well as the HBM were examined. This research was intended to extend the literature on social factors related to e-cigarette user status as well as e-cigarette dependence. Additionally, perceived harm was examined as a potential moderator in these conditional indirect effects models, such that the relationship between positive social enhancement expectancies and e-cigarette user status and dependence was hypothesized to be weaker at higher levels of perceived harm from e-cigarette products.

It was expected that injunctive social norms would directly, negatively predict positive social enhancement expectancies because higher scores on the injunctive norms scale indicated a perception of e-cigarettes as less socially acceptable. This hypothesis was supported, such that as e-cigarettes were perceived to be less socially acceptable among others (i.e., high injunctive social norms), participants reported less expectancies of positive social outcomes resulting from e-cigarette use. This suggests that when participants did not believe others found e-cigarettes to be socially acceptable, they would not expect to gain any social capital resulting from use. Additionally, the literature has been consistent in finding that injunctive social norms act as a predictor for e-cigarette use among young adults and adolescents (Fadus et al., 2019; Kong et al., 2015; Noland et al., 2016).

When trying to predict e-cigarette use status (i.e., user vs. non-user), it was hypothesized that injunctive social norms would negatively predict odds of e-cigarette user status. Further, it

was hypothesized that injunctive norms would show a similar relationship with e-cigarette dependence, such that it was expected that higher perceived acceptability of e-cigarettes (i.e., injunctive norms) would be associated with higher dependence among e-cigarette users. Consistent with the literature (Fadus et al., 2019; Kong et al., 2015; Noland et al., 2016), results indicated that if one perceived e-cigarettes as less socially acceptable among others, participants were less likely to endorse being a current e-cigarette user.

Combining users and non-users, injunctive norms were moderately low for this sample. This was indicated via moderately high scores on the injunctive norms scale as lower scores indicated higher acceptability and higher scores indicated lower acceptability. Based on the results from the data, participants in this sample generally felt that others did not care if they used e-cigarettes or not, however, scores trended towards others feeling e-cigarette use was unacceptable. In order to gain a deeper understanding of scores on this scale and which groups viewed e-cigarettes as more or less socially acceptable, each item for injunctive norms was examined. In order to measure injunctive norms, participants rated how they thought others around them would feel if they were to use e-cigarettes. Groups that were examined included parents ($M = 1.76$, $SD = 0.50$), professors ($M = 1.64$, SD 0.49), peers ($M = 1.24$, $SD = 0.64$), friends ($M = 1.19$, $SD = 0,76$), significant other ($M = 1.41$, $SD = 0.74$), siblings ($M = 1.48$, $SD = 0.70$), and coworkers ($M = 1.22$, $SD = 0.68$). Means and standard deviations from the data would suggest that participants felt that peers', friends, and coworkers generally tend towards indicating that they do not care if the participants were to use e-cigarettes whereas participants felt that parents, professors, significant others, and siblings tended towards feeling e-cigarettes were less acceptable. E-cigarettes are likely thought of as unique or different from other substances in that many individuals indicate thinking that e-cigarettes present little to no harm (Anand et al., 2015).

My data suggests that this relationship may be driven by peer influences among college students. Among users, injunctive norms followed a similar trend with e-cigarette dependence, such that higher injunctive norms (i.e., low scores) was related to higher levels of dependence; however, the low number of e-cigarette users (n = 49) precluded significance.

Additionally, in line with current research (Barker et al., 2019; Pokhrel et al., 2015), it was predicted that positive social enhancement expectancies would positively predict e-cigarette user status, such that higher social enhancement expectancies should relate to greater odds of being an e-cigarette user. Unfortunately, this relationship was not supported in the current sample. Whereas research has shown that social norms act as a strong predictor of e-cigarette use (Lee et al., 2017), less is known about the influence of social enhancement expectancies on use status. Although positive social enhancement expectancies were a significant predictor for past 30-day, e-cigarette use in the scale creation study, it was not a robust predictor when compared to other outcome expectancy domains that were measured in the scale creation study (Pokhrel et al., 2014). Despite a significant correlation between social enhancement expectancies and e-cigarette user status, once perceived harm and injunctive social norms were controlled for, positive social enhancement expectancies were not related to use. This result confirms Pokhrel et al.'s findings that when no other predictors are added to the model, social enhancement expectancies were significantly correlated with e-cigarette user status. However, this relationship was not robust when other predictors were added to the model. It appears that although social enhancement expectancies is correlated with use status, the relationship is overshadowed by injunctive norms.

Similarly, it was hypothesized that positive social enhancement expectancies would be positively associated with e-cigarette dependence; however, this hypothesis was not supported.

Additionally, positive social enhancement expectancies showed the opposite relationship to what was hypothesized such that positive social enhancement expectancies were negatively related to e-cigarette dependence. This result is contrary to findings from Mayorga et al. (2019) in which daily users reported greater perceived benefits from e-cigarette use compared to non-daily users. Perceived benefits assessed by Mayorga et al. included being able to use e-cigarettes indoors, which is often referred to when participants refer to perceived acceptability. Similarly, Doran and Brikmanis (2016) found that positive outcome expectancies for e-cigarettes were associated with heavier use over a two-week period, which implies that people with increased e-cigarette dependence should have endorsed higher social enhancement expectancies. Both studies suggest that dependence should have been related to positive social enhancement expectancies. Only one domain of outcome enhancement expectancies were assessed for this study, whereas Mayorga et al. and Doran and Brikmanis examined multiple aspects of positive outcome expectancies such as affect regulation. It is possible that social enhancement expectancies are not robust enough of a predictor without the inclusion of other domains of outcome expectancies to be able to predict dependence. This analysis also suffered from low power due to few e-cigarette users which may have also influenced the directionality of the relationship. Evidence for this can be seen in that when examining the data set assuming '1' for all missing values, the relationship between m positive social enhancement expectancies and dependence becomes weaker and less negative.

Because social enhancement expectancies were not related to e-cigarette user status, the mediation of the relationship between injunctive norms and e-cigarette user status was unlikely. Rather, as mentioned above, it is more likely that social enhancement expectancies were overshadowed by the relationship between injunctive norms and e-cigarette user status as opposed to mediating the relationship between these two. Further, the same conclusion can be

drawn for mediation of the relationship between injunctive norms and e-cigarette dependence, such that mediation was unlikely to occur because social enhancement expectancies were unrelated to e-cigarette dependence.

Additionally, perceived harm was examined as a moderator between positive social enhancement expectancies and e-cigarette user status as well as e-cigarette dependence. Contrary to hypotheses, perceived harm did not moderate the relationship between social enhancement expectancies and e-cigarette user status, nor did it moderate the relationship between social enhancement expectancies and e-cigarette dependence. When examining the data further, e-cigarette users and non-users showed similarly high levels of perceived harm. Despite consistently high scores across groups, perceived harm was a marginally significant predictor of e-cigarette user status when examined on its own ($p = .040$). This suggests that when other variables were added to the model, perceived harm was not a strong enough predictor to be able to exert a moderating effect. This finding is consistent with the literature in that egocentrism is common among youth which promotes feelings of invulnerability (Wickman et al., 2008). which would likely reduce the saliency of perceived harm. However, perceived harm did show the hypothesized moderating trend such that as perceived harm increased, the relationship between positive social enhancement expectancies and e-cigarette user status did become slightly weaker. As mentioned above, it is likely that the impact of perceived harm was overshadowed by the addition of other variables in this model. However, when examining the same relationship among only users, it is more likely that the ability to detect moderation was impacted by the lack of power resulting from only being able to use a small sample of e-cigarette users. Under these conditions, the ability to detect a moderating effect was greatly reduced and unlikely.

However, despite the lack of moderation, perceived harm had a direct positive relationship with e-cigarette dependence, which suggests that among e-cigarette users, participants who indicated a heavier dependence on e-cigarettes also indicated perceiving e-cigarettes as more harmful. A substantial portion of the literature has examined differences between e-cigarette users and non-users or experimentation with e-cigarettes (Fadus et al., 2019; Gorukanti et al., 2017; Kong et al., 2015; Noland et al., 2016). However, trends among e-cigarette users, specifically as it applies to e-cigarette dependence, have seldom been explored.

This result between perceived harm and e-cigarette dependence is contrary to what the HBM would suggest. Specifically, the HBM would assert that perceived harm would function as a deterrent for negative health behaviors. For example, e-cigarette perceived harm has been found to be higher among non-users when compared to e-cigarette users (Hershberger et al., 2017). Although not significant in the model examined, a similar trend in perceived harm between users and non-users was observed in this study. This relationship likely exists among users because highly dependent users would be more likely to perceive increased harms as a function of their dependence on the product. In other words, people who are highly dependent are more aware of the harms. One reason that has often been given in the literature for avoiding e-cigarettes is the addictive potential (Park et al., 2019; Pokhrel et al., 2014; Pokhrel et al., 2015), which implies that dependence, may inherently be considered harmful. Dependence may, therefore, be viewed as harmful among users, which allows highly dependent users to be more self-aware of the harm that they are causing. Conversely, those who are not heavily dependent likely have not experienced the harmful effects of dependence and are therefore less likely to have this self-awareness.

PRACTICAL IMPLICATIONS

Results from this study have implications across multiple domains. The significant negative relationship between injunctive social norms and social enhancement expectancies as well as the significant direct relationship between injunctive social norms and e-cigarette use status further emphasizes that social factors may play a substantial role in discerning between users and non-users. In light of these results, future interventions should target perceptions of e-cigarettes as socially acceptable and peer attitudes to reduce perceptions of e-cigarettes as being socially acceptable. Ratings on the injunctive norms scale in this study indicated that participants perceived that peers would not care if they used e-cigarettes given that the average score when examining scores for peers, friends, and coworkers was associated with the perception of others not caring whether participants used e-cigarettes or not. College students spend a large amount of their time around their peers as a function of being a full-time college student. Reducing these perceptions regarding how peers feel about their e-cigarette use may prove beneficial in reducing perceptions of e-cigarettes as being acceptable. Additionally, reducing these perceptions may ultimately lead to a reduction in incidence rates of e-cigarette use in young, vulnerable, populations. Future researchers should examine the use of a brief motivational intervention among this population. Additionally, electronic delivery of an intervention should be explored in order to reach a wider range of college students further increasing the odds of reducing perceptions of e-cigarettes as socially acceptable and reducing prevalence of e-cigarette use.

Additionally, users who perceive elevated levels of harm from e-cigarettes may be ideal targets for interventions aimed at reducing e-cigarette use. Because higher perceived harm was related to increased dependence among e-cigarette users, it can be argued that individuals who are more dependent on e-cigarettes may be better targets for interventions. Specifically, it

appears that these individuals are actually experiencing greater harm because of their increased dependence on e-cigarettes.

LIMITATIONS

The results of this study should be interpreted in light of some of some limitations. The first limitation was an error during the data collection process. As mentioned in the results, a programming error resulted in the inability to distinguish between a response of '1' from missing data for a large number of participants on the ESOEM scale. Specifically, because the default answer was a '1', if a participant did not click on the sliding scale to leave it a '1', then the data collection software coded the response as missing data. As a consequence, some relationships were weaker than if the entire sample been used such that when the entire dataset is examined. To understand the impact of this error, the data were examined as if all missing values for social enhancement expectancies were a 1. The relationship between positive social enhancement expectancies and e-cigarette user status did become slightly stronger (b = .037) as opposed to when "1" was not assumed on this scale (b = .029), however, it still was not significant. This does, however, indicate that the relationship reflected when comparing e-cigarette users to non-users was minimally impacted by this coding error supporting accuracy of the results derived from the final analytic sample. In order to determine the overall impact of this coding error, all other relationships were also examined assuming a value of "1" for missing social enhancement expectancy values. Results from these analyses are similar to the relationship discussed for positive social enhancement expectancies above such that the directionality of relationships did not change, and no variables were found to be significant in the models assuming "1" that were not significant in the models used for this study.

Similarly, another limitation of this study is the small sample size of e-cigarette users. This was partially the result of the above-mentioned limitation in which a substantial portion of participants were dropped from the data set. Naturally, some e-cigarette users were among those who were not able to be used for the final analytic sample. However, the incidence of e-cigarette use in this sample was slightly lower than other studies which assessed e-cigarette use rates (Cooper et al., 2018; Diez et al., 2019; Kinnunen et al., 2018). Among these studies, e-cigarette use rates were as high as 34% creating a more equal distribution of users and non-users for the analytic sample. Having a slightly lower incidence of e-cigarette use rates for this study may have made it difficult to directly compare e-cigarette users to non-users given the skewed distribution of non-users as compared to users. Assuming the missing data were '1', the distribution of users to non-users was still skewed with a small portion of the sample endorsing current e-cigarette use ($n = 85$, 17.7%). Moreover, such a small sample size of users has implications for power. With such a small sample size, the ability to detect an effect was limited to only large effect sizes. As mentioned above, the model for this study that examined dependence as an outcome was re-examined when assuming "1" for all missing data on the positive social enhancement scale. Therefore, relationships among the 85 participants that indicated being a current user in the full sample were able to be examined. Relationships were minimally impacted such that directionality did not change nor did significance of any predictors. However, 85 users is still a small sample of users which ultimately, likely resulted in the inability to detect relationships predicting e-cigarette dependence, which should be present in a larger sample.

FUTURE DIRECTIONS

Future studies should examine other social factors that contribute to discerning between e-cigarette users and non-users. An example of one such construct that should be explored is descriptive norms. A current goal of e-cigarette research should be to develop an efficacious intervention in order to reduce e-cigarette use and thereby decreasing harm resulting from e-cigarette use. Although this study does suggest a heavy influence of injunctive norms, other social factors are not as well understood and should be examined.

Additionally, determining causality in the relationship between injunctive norms and e-cigarette user status may prove to be a beneficial endeavor. Researchers should use a longitudinal design and try to follow participants before they initiate use to determine if perceptions of norms change as a function of use or if norms are a driving factor in influencing e-cigarette initiation. Researchers should also continue to explore the relationship between perceived harm and e-cigarette dependence. This relationship should be replicated and factors that may influence this relationship should be explored further. Determining the nature of this relationship may aid in targeting specific individuals for intervention efforts which would, again, aid in maximizing efficacy of any intervention programs.

CONCLUSIONS

This study examined injunctive social norms, positive social enhancement expectancies, and perceived harm in relation to both e-cigarette user status and e-cigarette dependence. Findings suggested that, in line with the current literature, injunctive social norms exert a substantial influence on e-cigarette use behaviors. Additionally, researchers may want to further explore the relationship between perceived harm and e-cigarette dependence among e-cigarette users to better understand within group differences among e-cigarette users. E-cigarettes are an

extremely prolific nicotine product with high rates of use among youth populations (Diaz et al., 2019). Given the novelty and continued growth in popularity of e-cigarettes in this emerging adult population, understanding factors associated with e-cigarette use should be a continued priority to mitigate harm resulting from the use of these tobacco products.

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APPENDIX A

TABLES

Table 1

Participant Demographics

Sample Demographics	N	%	M	SD	Min./Max.
Age			20.32	1.77	18/25
E-cigarette user status					
User	192	79.7			
Non-user	49	20.3			
Year in school					
Freshman	77	32.0			
Sophomore	56	23.2			
Junior	57	23.7			
Senior	51	21.3			
Race					
American Indian or Native Alaskan	1	.4			
Asian	18	7.5			
Black or African American	81	33.6			

Table 1 continued

Native Hawaiian or Pacific Islander	3	1.2			
White	108	44.8			
Other	29	12.0			
Sex					
Female	183	75.9			
Male	55	22.8			
Prefer not to answer	1	.4			
Gender					
Woman	178	73.9			
Man	55	22.8			
Gender queer/non-conforming	2	.8			
Nonbinary	3	1.2			
Other	1	.4			
Prefer not to answer	1	.4			
E-cigarette outcome expectancies			2.81	1.86	1.00/10.00
Injunctive Norms			1.43	0.53	0.00/2.00
Perceived Harm			7.40	1.74	1.00/9.00

Table 2

Predictor Correlations and Cronbach's Alphas

	Outcome Expectancies	Injunctive Norms	Perceived Harm	E-cigarette Use	E-cigarette Dependence
Outcome Expectancies	.952				
Injunctive Norms	-.217**	.910			
Perceived Harm	-.288**	.182**	.936		
E-cigarette Use[a]	.089	-.307**	-.135*	---	
E-cigarette Dependence	-.108	.193	.282*	---	.988

[a] = Dichotomously coded as user (1) and non-user (0).

*** = p < .01; * = p < .05.*

Table 3

Conditional Indirect Effects Model 1

	Coefficient	SE	Z	Odds Ratio	LLCI	ULCI
Constant	-1.49***	.18	-8.13	.23	-1.85	-1.13
Injunctive Norms	-1.36***	.32	-4.20	.26	-1.99	-0.72
Outcome Expectancies	.03	.09	0.31	1.03	-0.16	0.21
Perceived Harm	-.17	.10	-1.61	.84	-0.37	0.04
Social enhancement Expectancies x Perceived Harm	.06	.04	1.38	1.06	-0.03	0.15
Indirect effect	-.02	.07	--	--	-0.17	0.13

*** = p < .001 Outcome: E-cigarette Use

Table 4

Conditional Indirect Effects Model 2

	Coefficient	SE	t	LLCI	ULCI
Constant	21.77	4.68	6.15	19.34	38.19
Injunctive Norms	-9.49	6.86	-1.38	-23.32	4.33
Outcome Expectancies	-1.27	2.57	-0.49	-6.45	3.91
Perceived Harm	6.16*	3.02	2.04	0.08	12.24
Social enhancement Expectancies x Perceived Harm	-1.44	1.48	-0.97	-1.69	2.19
Indirect effect	-.06	1.17	--	-2.42	2.54

$* = p < .05$
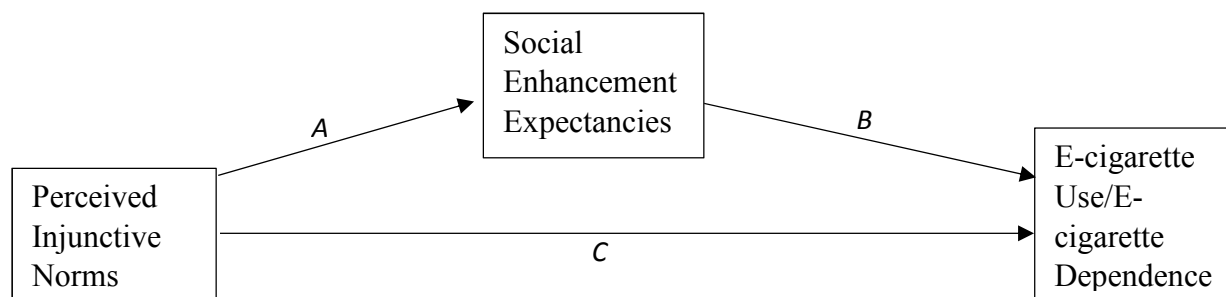
APPENDIX B

FIGURES
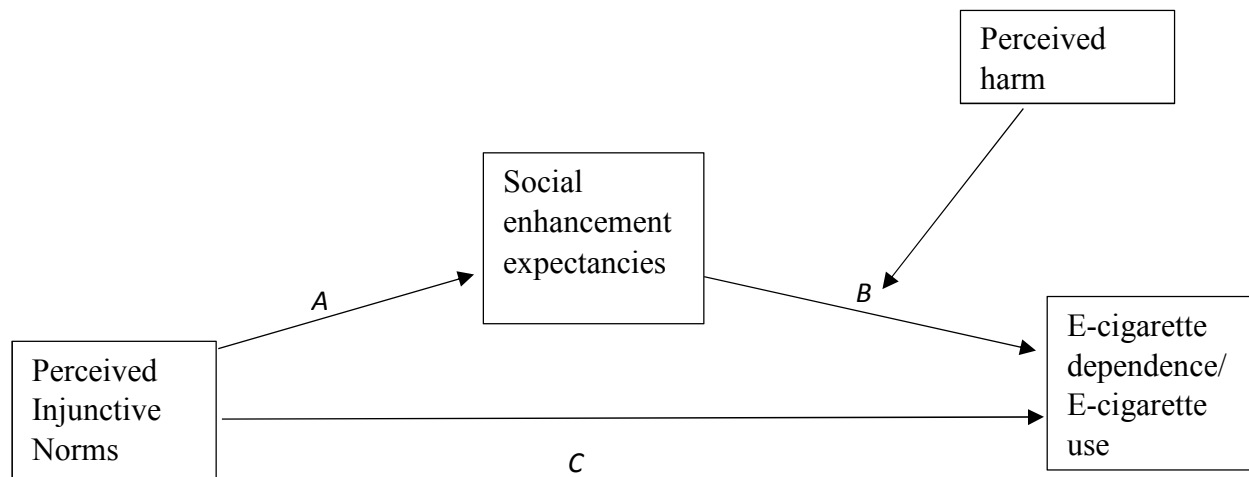
Figure 1

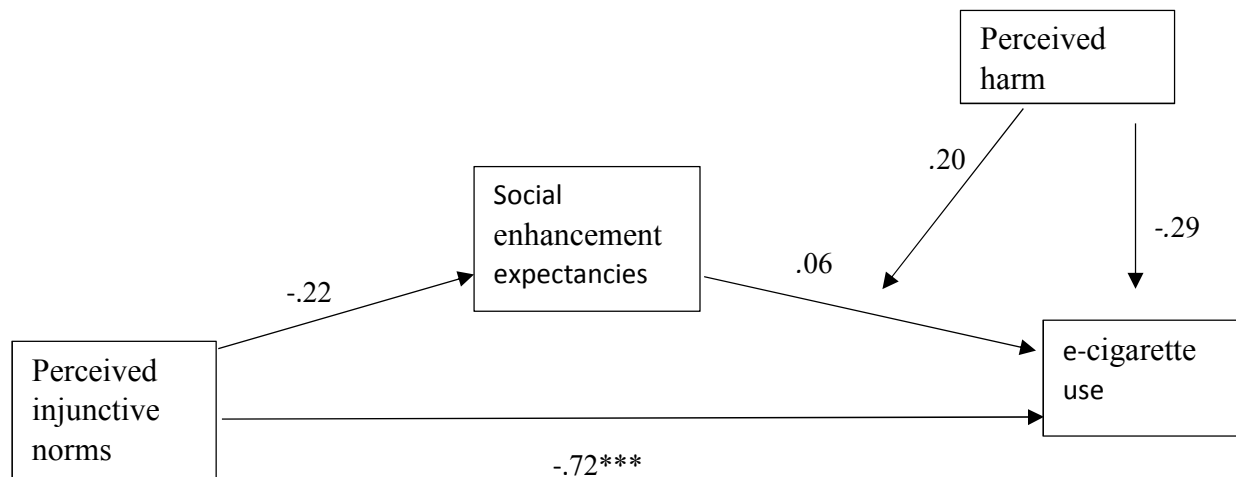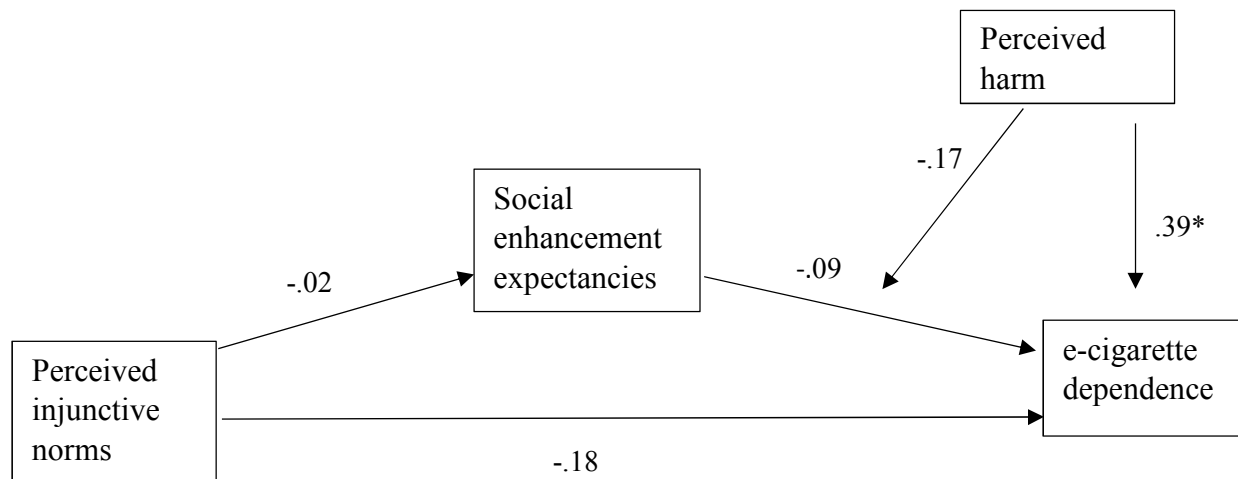*Mediation Model*

Figure 2

Moderated Mediation Model

Figure 3

Standardized Relationships for E-cigarette Use

Note. Shows standardized relationships for the moderated mediation model (n = 241). ***p <

.001

Figure 4

Standardized Relationships for E-cigarette Dependence

Note. Shows standardized relationships for the moderated mediation model (n = 49). **p < .05*

APPENDIX C

MEASURES

Demographics

All responses to survey items will be kept secure and will remain anonymous. None of the information

gathered from survey items will be used for discriminatory purposes.

Your age:
_____

Your biological sex assigned at birth:
{Choose one}
( ) Male   ( ) Female

Gender identity:
{Choose one}
( ) Man   ( ) Woman   ( ) Nonbinary   Gender identity_____ _____

Year in school:
{Choose one}
( ) Freshman   ( ) Sophomore ( ) Junior   ( ) Senior   ( ) Graduate

Your Race:
{Choose multiple}
( ) American Indian or Alaska Native   ( ) Asian   ( ) Black or African American
( ) Native Hawaiian or Pacific Islander   ( ) White   ( ) Other _____

Are you Hispanic, Latino, or of Spanish origin?
{Choose multiple}
( ) No ( ) Yes, Mexican or Mexican American   ( ) Yes, Cuban   ( ) Yes, Puerto Rican
( ) Yes, Other _____

Your marital status:
{Choose one}
( ) Never Married   ( ) Married   ( ) Separated   ( ) Divorced   ( ) Widowed

Your sexual orientation:
{Choose one}

( ) Exclusively heterosexual
( ) Mostly heterosexual
( ) Equally heterosexual and homosexual
( ) Mostly homosexual
( ) Exclusively homosexual

Injunctive Norms for Tobacco Products

Hansen, P. E., Siersma, V., Ross, L., Mortensen, E. L., Riegels, M., Tjornhoj-Thomsen, T., &
Johansen, C. (2007). Psychometric properties of a brief indexes designed to measure
social-cognitive predictors of smoking initiation. Drug and Alcohol Dependence, 88(1),
64-74. https://doi.org/10.1016/j.drugalcdep.2006.09.015.

The following items concern how acceptable e-cigarette use is. Please rate each item on a scale
from 0-2 to indicate level of acceptability.

Select from the following responses:

0 = Think that it is OK if I smoke

1 = Don't care if I smoke or not

2 = Don't think that I should smoke

Don't know/Not applicable

Item 1: Parents

Item 2: Professors

Item 3: Peers

Item 4: Friends

Item 5: Significant other

Item 6: Siblings

Item 7: Coworkers

Injunctive Norms for E-cigarettes

Hansen, P. E., Siersma, V., Ross, L., Mortensen, E. L., Riegels, M., Tjornhoj-Thomsen, T., &
Johansen, C. (2007). Psychometric properties of a brief indexes designed to measure
social-cognitive predictors of smoking initiation. Drug and Alcohol Dependence, 88(1),
64-74. https://doi.org/10.1016/j.drugalcdep.2006.09.015.

The following items concern how acceptable e-cigarette use is. Please rate each item on a scale
from 0-2 to indicate level of acceptability.

Select from the following responses:

0 = Think that it is OK if I vape

1 = Don't care if I vape or not

2 = Don't think that I should vape

Don't know/Not applicable

Item 1: Parents

Item 2: Professors

Item 3: Peers

Item 4: Friends

Item 5: Significant other

Item 6: Siblings

Item 7: Coworkers

Social Enhancement Expectancies

Pokhrel, P. Little, M. A., Fagan, P., Muranaka, N., Herzog, T. A. (2014). Electronic cigarette use

outcome expectancies among college students. Addictive Behaviors, 39(6), 1062-1065.

https://doi.org/10.1016/j.addbeh.2014.02.014

The next set of items are commonly given expectations resulting from e-cigarette use. Please rate

these items on how likely you believe each outcome to be on a scale from 1-10 with 1 being not

at all likely and 10 being extremely likely.

If I use e-cigarettes I expect to…

Item 1: Gain respect of friends

Item 2: Increase chances of being liked by friends

Item 3: Increase chances of being liked by the opposite sex

Item 4: Make life less dull

Item 5: Look Sophisticated

Item 6: Become more popular

Item 7: Look more attractive

Item 8: Belong to an exclusive group

Item 9: Fit in better with friends

Item 10: Increase status

Perceived Harm

Waters, E. A., Mueller-Luckey, G., Levault, K., & Jenkins, W. D. (2017). Perceived harms and
social norms in the use of electronic cigarettes and smokeless tobacco. *Journal of Health
Communication, 22*, 497-505. https://doi.org/10.1080/10810730.2017.1311972

The following items are designed to assess perceived harm of e-cigarette use. Please rate each item on the following 9-point scale.

1 = Strongly disagree

2 = disagree

3 = moderately disagree

4 = mildly disagree

5 = undecided

6 = Mildly agree

7 = Moderately agree

8 = Agree

9 = Strongly agree

Item 1: E-cigarette use takes years off of my life

Item 2: E-cigarette use damages my health

Item 3: More e-cigarette use, more health risks

Item 4: Using e-cigarettes risks heart disease

Item 5: Using e-cigarettes risks lung disease

E-cigarette Dependence

Morean, M. E., Krishnan-Sarin, S., Sussman, S., Foulds, J., Fishbein, H., Grana, R., & O'Malley,

S. S. (2019). Psychometric evaluation of the e-cigarette dependence scale. *Nicotine &*

Tobacco Research, 21(11), 1556-1564. https://doi.org/10.1093/ntr/ntx271

Please respond to each question or statement by marking one box per row using the following

rating scale ranging from 0-4.

0 = Never

1 = Rarely

2 = Sometimes

3 = Often

4 = Almost always

1: I find myself reaching for my e-cigarette without thinking about it.

2: I vape more before going into a situation where vaping is not allowed.

3: I drop everything to go out and buy e-cigarettes or e-juice.

4: When I haven't been able to vape for a few hours, the craving gets intolerable.

5: When I'm really craving an e-cigarette, it feels like I'm in the grip of some unknown force

that I cannot control.

6: I crave Vaping at certain times of the day

7: My urges to vape keep getting stronger if I don't vape

8: After not vaping for a while, I need to vape in order to avoid feeling any discomfort.

9: My desire to vape seems overpowering.

10: Cravings for an e-cigarette make it difficult for me to quit.

11: It is hard to ignore urges to vape.

12: When I go without vaping for a few hours, I experience craving.

13: I frequently crave e-cigarettes/vaping.

14: The idea of not vaping causes me stress.

15: When I run out of e-cigarettes or e-juice, I find it almost unbearable.

16: I get a real gnawing hunger for an e-cigarette when I haven't vaped in a while.

17: I vape even when I am so ill that I am in bed most of the day.

18: When I go too long without vaping I feel impatient.

19: It is hard for me to go without vaping for a whole day.

20: When I go too long without vaping, I get strong urges that are hard to get rid of.

21: Vaping I a large part of my daily life.

22: I am tempted to vape when I realize I haven't vaped for a while.

E-cigarette use

Giovenco, D. P., Lewis, M. J., & Delnevo, C. D. (2014). Factors associated with e-cigarette use:

A national population survey of current and former smokers. *American Journal of*

Preventive Medicine, 47(4), 476-480. https://doi.org/10.1016/j.amepre.2014.04.009

1. Have you ever used e-cigarettes?

Response options:

1. Never

2. More than 30 days ago

3. Within the last 30 days

2. When was the last time you used e-cigarettes?

3. During the past 30 days, on how many days did you use e-cigarettes?

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PRESENTATIONS

Hanson, S. N., Fitzer, S. A., & Henson, J. M. (2023). A direct comparison of injunctive and descriptive norms in discerning between e-cigarette user status. Poster submitted to the Collaborative Perspectives on Addiction (CPA) Meeting, Albuquerque, New Mexico

Henson, J. M., **Hanson, S**., Fitzer, S., & Pearson, M. (2023). Are alcohol consequences due to alcohol use? Poster submitted to the Collaborative Perspectives on Addiction (CPA) Meeting, Albuquerque, New Mexico.