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**Author**

Rahman, Nicola, Sofija, Ernesta, Sebar, Bernadette

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## Article

# Examining Intention to Quit Vaping among Australian Young Adults Using Social Cognitive Theory: A Cross-Sectional Survey Analysis

Nicola Rahman <sup>\*</sup>, Ernesta Sofija  and Bernadette Sebar

School of Medicine and Dentistry, Griffith University, Southport, QLD 4215, Australia; e.sofija@griffith.edu.au (E.S.); b.sebar@griffith.edu.au (B.S.)

\* Correspondence: nicola.rahman@griffith.edu.au

**Abstract:** This study examined how Social Cognitive Theory (SCT) constructs help explain the intention to quit e-cigarettes in young Australian adults aged 18–24 years to inform vaping cessation programs. A cross-sectional survey of young adult vapers ( $n = 422$ ) between March and the end of May 2023 examined personal, environmental, and behavioural factors of vaping cessation. Hierarchical multiple regression analysis examined the effects of SCT constructs on intention to quit vaping, controlling for covariates. Results found, in our sample consisting of 68% ( $n = 360$ ) females, 18% ( $n = 95$ ) males and 14% ( $n = 77$ ) others, almost two-thirds (59.7%) of participants reported a quit attempt in the last year; with quit attempts being associated with quit intention ( $p \leq 0.001$ ). Model 1 (past year quit attempt, gender, educational attainment) accounted for 28.7% of the variance in quit intentions, with the addition of Model 2 SCT constructs adding a further significant 6.3% variance. Self-efficacy ( $B = 0.164$ ,  $p \leq 0.001$ ), benefits ( $B = -0.106$ ,  $p = 0.041$ ) and social norms ( $B = -0.086$ ,  $p = 0.035$ ) had significant independent associations with quit intention. Findings demonstrate the SCT theoretical framework is suitable for use when developing vaping cessation programs, identifying the SCT constructs as important factors for quit intention. The findings can be used to inform the development of evidence-based vaping cessation programs to encourage vapers to quit and/or better support them in the quitting process.

**Keywords:** vaping cessation; quit intention; Social Cognitive Theory; young adults



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## 1. Introduction

The prevalence of e-cigarette use, or vaping, among young people has been described as an epidemic [1]. In Australia, the prevalence of vaping among those aged 14 years and over has increased from 2.5% in 2020 to 7.5% in 2022 [2]. Among young adults aged 18–24 years, one in five non-smokers had tried vaping, and 4.8% reported current use between 2020–2021 [3]. Most recent data show a dramatic increase in reported six-month prevalence estimates in this age group from 2020 to late 2022, from 5.6% to 21.4% [2].

Increasing vaping prevalence is of concern given the associated adverse health outcomes, such as poisoning, inhalation toxicity and seizures [4]. E-cigarette or Vaping product use-Associated Lung Injury (EVALI) has led to hospitalisations and fatalities, largely related to e-cigarettes containing vitamin E acetate [5]. Exploding vaping products have caused burns and injuries, and product use has contributed to environmental pollution and waste [4]. Of significance is the threefold increased risk of smoking following vaping initiation [4] and the nicotine dependence [6]. Furthermore, young adults using vapes while attempting to quit smoking have reported continued vaping or even dual use [7], creating a new public health concern.

Evidence from the United States (US) demonstrates young adult vapers are reporting intentions or attempts to quit [8]. Many users are accessing smoking cessation programs for support [9]. However, the nuances around vaping cessation remain unclear [10], with

limited research on associated factors with quitting [6,7]. Much of the current understanding of what influences intention to quit is based on smoking cessation research [11,12], with prior quit attempts being significantly associated with higher quit intention [13]. The World Health Organization argues countries need to consider providing support for e-cigarette users to quit [9]; this suggests a need for vaping cessation programs.

There is growing e-cigarette research in US populations on factors influencing quit intention and attempts among adolescents [14], older adults [15] and specific vaping products [14]. However, there is a dearth of evidence examining Australian youth and young adult vaping cessation, with the focus being on intentions to use [16], vaping patterns [17] and associated risks [18]. While these are endorsed considerations for vaping cessation research [10], it is important to understand the cognitive processes that either support or inhibit the first phase of quitting, quit intention, to understand how best to support someone in the process.

Previously, behaviour change theories have helped in understanding the complexities of associated factors with cessation practice; the stages of change model in smoking cessation [19] and the theory of planned behaviour with vaping cessation [20]. This current study employs Social Cognitive Theory (SCT) [21], as the theoretical constructs are considered to align closely with the nuances of vaping behaviour, and the framework incorporates the social and environmental context of the behaviour [10]. SCT describes how people learn and maintain behaviours and proposes that behavioural, personal and environmental factors determine a behavioural outcome [21]. These factors can be illustrated in the context of vaping with the cognitive constructs of self-efficacy, perceptions of e-cigarettes, and social norms [10]. Self-efficacy can be described as an individual's confidence in their own ability to succeed with the behaviour change of quitting vaping, requiring a sense of agency to fulfil the behaviour change goal [21]. Perceptions of e-cigarettes can be operationalised via perceived risks and benefits of vaping, factors that may influence behaviour change [10]. Social norms can be understood as the social acceptability of an individual's vaping by friends, family and the community, thereby influencing an individual's intention to continue or quit vaping [10].

Self-efficacy has been utilised in previous research on smoking relapse [22], comparing quit intention in adult smokers and vapers [23], and as part of vaping research utilising other behaviour change frameworks [20]. It has been demonstrated to be a significant cognitive factor in these instances. Research has previously explored knowledge, perceptions and attitudes towards vaping to identify associated factors [24]. However, there has been limited research on their effect on a vaper's quit intention [20]. Social norms have previously been demonstrated to be influenced by distinct regulatory environments and an associated factor in both e-cigarette use and quitting [10]. This study seeks to address the limited understanding of these SCT constructs and their effects on young adult vapers' quit intentions. Quit intention has also previously been examined for associations with demographic factors. There have been conflicting results on the associations with gender [14,17], educational attainment [25,26], age, and income [25,27]. The original validation of our chosen quit intention tool, the Contemplation Ladder, revealed no gender or age association but showed a significant increase in quit intention with higher educational attainment [13]. Demographic variables were therefore considered potentially confounding to the effects of the SCT constructs on quit intention and will be analysed and controlled for in the present study.

The purpose of the current study was to explore if self-efficacy, perceptions of e-cigarettes and social norms were associated with intention to quit vaping. Understanding the association between these behavioural, cognitive and environmental factors and quit intention can inform vaping cessation programs to encourage young adults to quit and maximise the efficacy of the quitting process. We hypothesised that after controlling for covariates, there would be a significant association between Social Cognitive Theory constructs and quit intention.

## 2. Materials and Methods

### 2.1. Study Design and Participants

Data were collected over a 12-week period through an online cross-sectional survey ( $n = 422$ ) of young adult vapers using LimeSurvey with participant recruitment via advertisements on social media platforms including Facebook, Instagram and LinkedIn, the university's research volunteer broadcast, and the distribution of flyers in community locations such as gyms and cafes. Participation was voluntary and included the option of entering a prize draw to win a \$300 gift voucher. To be eligible to participate, young adults needed to be 18–24 years old and be an Australian Citizen or Permanent Resident currently living in Australia. The LimeSurvey platform commenced with a question to eliminate potential fraudulent responses, or so-called 'survey bots'. The survey included questions on demographics, vaping frequency, quit intentions and attempts, and measures of personal, behavioural and environmental constructs of SCT. The study was approved by the university Human Research Ethics Committee (GU Ref 2022/925).

### 2.2. Measures

#### 2.2.1. Demographic Variables

Age, gender, ethnicity, educational attainment, study and employment status, and income were assessed. For the purposes of regression analysis, the gender 'other' group was recoded from gender-diverse [e.g., transsexual], non-binary and prefer not to say, due to low cell counts. Educational attainment was measured as incomplete high school, year 12 completion, post high school certificate/diploma and university graduation.

#### 2.2.2. Vaping Frequency and Concurrent Smoking

The participants' vaping frequency was assessed using a recommended core item for population-based e-cigarette surveys [28]; the result of a global research initiative of 65 experts across 15 countries and based on their interpretations and experience of using major tobacco and e-cigarette surveys [28]. This core item asked the question, 'How often do you use a vaping device', with response options of 'daily or almost daily', 'less than daily, but at least once a week', 'less than weekly, but at least once a month', and 'less than monthly'. This variable was then dichotomised for regression analysis into daily and non-daily vaping, as bivariate analysis demonstrated no significance between vaping frequency groups with quit intention and low cell counts for categories of less frequent vaping. Concurrent smoking was assessed by asking, 'Have you previously or do you currently smoke cigarettes', with the response options of 'yes, I have previously smoked cigarettes', 'yes, I smoke in addition to vaping' and 'no, I have never smoked cigarettes'.

#### 2.2.3. Past Year Quit Attempt and Quit Intention

Past year quit attempt was assessed by asking, 'In the past 12 months, have you ever stopped using vapes because you were trying to quit for good', with the response options of yes/no [15]. Quit intention was measured by asking, 'Thinking of your current vaping, what are your quit intentions', with a 10-point scale response option for participants. This scale was adapted from the validated 11-point Contemplation Ladder used in smoking cessation research [13] and in contemporary vaping cessation research [15]. This tool was chosen as it incorporates a more socially acceptable way to indicate intentions [13], as opposed to a binary response of having an intention to quit or not. Verbal anchors provided an indication of what participants' intentions were from 'no thought of quitting' (1) through to 'taking action to quit' (10) [13]. Due to LimeSurvey functionality, the current study scale began at 1. For analysis purposes, this scale was treated as a continuous variable, displaying normal distribution upon observational assessment and having more than five response categories [29].

#### 2.2.4. Self-Efficacy

Self-efficacy can be understood as an individual's confidence in their ability to change a behaviour [21], in this case, to quit vaping. A single scale item was used to measure self-efficacy, asking the question: 'On a scale from 1 to 10, where 1 is not at all confident and 10 is extremely confident, how confident are you that you can quit vaping now'. The predictive validity of this scale for measuring self-efficacy has been supported by previous research [30] and used in contemporary vaping research [23].

#### 2.2.5. Perceptions of e-Cigarettes: Risks and Benefits

The perceived risks and benefits of vaping represent the individual's perceptions of e-cigarettes when thinking about vaping and/or quitting vaping. The validated Risks And Benefits of E-cigarette use (RABE) tool [24] was employed, asking participants to read each of the 30 items and indicate how strongly they agree or disagree with the likelihood of the statement using a 7-point Likert scale. The risks were assessed by 16 items (such as 'e-cigarettes contain toxic chemicals') and benefits by 14 items (such as 'e-cigarettes are safe'). Items were reverse coded where required, and total scale scores were assessed by calculating the average sum of items on each sub-scale. Cronbach's alpha was 0.76 and 0.85 for risks and benefits, respectively.

#### 2.2.6. Social Norms

Social norms have been operationally defined as the approval or disapproval of a behaviour, utilising a pre-existing 6-item scale of perceived social norms [31]. The first three questions of the scale measured the acceptability of vaping among friends, immediate/close family, and the community (unacceptable [1] to acceptable [7]). The second three questions measured the encouragement of vaping among friends, immediate/close family, and the community (strongly discouraged [1] to strongly encouraged [5]). The total scores of the six questions were added together to calculate a mean total score, with a lower score indicating a more favourable response (e.g., the behaviour of vaping is less endorsed). Cronbach's alpha was 0.64, which was lower than the previously reported 0.87 [31] and below the suggested cut-off for acceptable internal consistency of 0.70 [32]. Given the acceptance in previous research of such a value as 'adequate' [33], it was decided to interpret this scale's results with caution in the present study.

### 2.3. Data Analysis

Data were analysed using SPSS version 29, with frequencies checked for missing values and internal consistencies reported. Tests for normality and frequency distribution were performed. Descriptive statistics were used to assess demographics, vaping frequency, concurrent smoking status and intention to quit. Bivariate analyses using Pearson correlation, independent samples *t*-test and ANOVA were performed for variables previously found to be associated with quit intentions to identify potential covariates [13,14,25,27]. Covariate analyses were performed to identify any variables that may be highly correlated using Pearson's *r* and Spearman's rho correlation analysis. A hierarchical logistic regression was then performed to analyse the ability of the SCT constructs (self-efficacy, perceptions of e-cigarettes, and social norms) to explain the variance in the outcome of intention to quit vaping. The first model was used to assess variables of interest found to be associated with quit intention in the bivariate analysis and the literature, to ensure accuracy of the final regression model. The second model added the SCT variables.

## 3. Results

### 3.1. Participant Characteristics and Descriptive Analysis

In total, 733 surveys were received with data cleaning excluding 201 cases with either multiple missing values or outliers via listwise deletion. A further 110 cases were excluded from this analysis as they were reported to be former vapers. The final sample ( $n = 422$ ) consisted of 68% ( $n = 360$ ) females, 18% ( $n = 95$ ) males and 14% ( $n = 77$ ) other. Participants'

ages ranged from 18–24 years ( $M = 19.6$ ,  $SD 1.71$ ), 85% reported being of Caucasian ethnicity, and 95% had lived in Australia for more than 10 years. The descriptive characteristics and means ( $M$ ) and standard deviations ( $SD$ ) of continuous variables used in regression analysis are provided in Table 1.

**Table 1.** Characteristics of the Sample and Descriptive Analysis ( $n = 422$ ).

Variable	<i>n</i>	(%)	<i>M</i>	<i>SD</i>
Age			19.6	1.7
Gender				
Male	78	18.5		
Female	286	67.8		
Other	58	13.7		
Educational Attainment				
Year 10 or 11	28	6.6		
Year 12	230	54.5		
Post High School Certificate/Diploma	112	26.5		
University	52	12.3		
Study Status				
Full-time University	166	39.3		
Part-time University	38	9		
Full-time TAFE/VET	31	7.3		
Part-time TAFE/VET	19	4.5		
Not currently enrolled in a course	156	37		
Cert III, High School	12	2.8		
Employment Status				
Full-time permanent/contract	63	14.9		
Part-time permanent/contract	74	17.5		
Full-time casual	61	14.5		
Part-time casual	155	36.7		
Unemployed	69	16.4		
Income (average weekly, pre-tax from all sources)				
\$0–249/week	116	27.5		
\$250–499/week	122	28.9		
\$500–999/week	144	34.2		
>\$1000/week	40	9.4		
Vaping frequency				
Daily	364	86.3		
Non-daily	58	13.7		
Concurrent smoking				
Previously smoked cigarettes	235	55.7		
Smoking in addition to vaping	83	19.7		
Never smoked cigarettes	104	24.6		
Past year quit attempt <sup>a</sup>	252	59.7		
Quit intentions score			5.3	2.4
Self-efficacy			5.2	2.7
Risks of vaping			5.7	0.7
Benefits of vaping			3.5	1.0
Social norms			3.3	0.8

Note. <sup>a</sup> Reflects the number and percentage of participants answering ‘yes’ to this question.

### 3.2. Bivariate Analyses of Potential Covariates with Quit Intention

Of the demographic variables, gender was found to be associated with quit intention. A one-way ANOVA analysis using two dummy variables of male and other, and female as the referent category, found a statistically significant difference in quit intention between at least two groups ( $F(2,419) = 3.58$ ,  $p = 0.029$ ). Tukey’s HSD Test for multiple comparisons found that the mean value of quit intention was significantly higher in females than males ( $p = 0.044$ , 95% C.I. =  $-1.45$ ,  $-0.02$ ). A small effect size was indicated by the eta squared ( $\eta^2$ ) of 0.02. There was no significant difference in quit intention between the group means of educational attainment, using university graduation as the referent category and three

dummy variables ( $F(3,418) = 2.50, p = 0.059$ ). Quitting intention was also not associated with income ( $r = -0.03, p = 0.596$ ), age ( $r = -0.03, p = 0.541$ ), vaping frequency ( $r = -0.05, p = 0.284$ ) or concurrent smoking ( $F(2,419) = 1.227, p = 0.294$ ). A significant difference in quit intention was found using an independent samples *t*-test between those reporting a quit attempt in the last year ( $M = 6.37, SD = 1.9$ ) and those who did not ( $M = 3.82, SD 2.3$ );  $t(420) = -12.484, p \leq 0.001$ . The effect size, as measured by Cohen's *d*, was  $d = 2.05$ , indicating a large effect. The variables of gender and past year quit attempt (associated with quit intention in this sample) and educational attainment (significantly associated with quit intention in Biener and Abram's 1991 tool validation study) would be included as covariates in the regression analysis.

### 3.3. Associations between SCT Constructs and Intention to Quit

Prior to the hierarchical regression, Pearson *r* and Spearman rho correlation coefficients were calculated to ensure variables were not highly correlated. Relatively low correlations were observed except for past year quit attempt, demonstrating a moderate correlation with quit intention as expected. All tolerance values were greater than 0.1; zero-order correlations are provided in Table 2.

**Table 2.** Correlations of the Measures ( $n = 422$ ).

Variable	1	2	3	4	5	6	7	8	9
1. Quit intention	-	-0.06	-0.10 *	-0.02	0.52 **	0.14 **	0.22 **	-0.30 **	-0.19 **
2. Gender_other		-	-0.19 **	-0.04	0.01	-0.08	0.03	-0.14 **	-0.02
3. Gender_male			-	0.04	-0.08	0.11 **	-0.11 **	0.31 **	-0.00
4. Education <sup>a</sup>				-	-0.03	0.03	-0.15 **	0.10 *	0.01
5. Past Year Quit Attempt					-	-0.07	0.15 **	-0.27 **	-0.15 **
6. Self-efficacy						-	0.01	-0.03	-0.02
7. Risks							-	-0.54 **	-0.08
8. Benefits								-	0.16 **
9. Social Norms									-

<sup>a</sup> Spearman Rho correlation reported. \*  $p \leq 0.05$ . \*\*  $p < 0.01$ .

Hierarchical multiple regression was employed to determine if the addition of the SCT constructs improved the explanatory variance of quit intention over and above gender, educational attainment and past year quit attempt alone. Model 1 included gender, educational attainment, and past year quit attempt as independent variables, with quit intention as the outcome variable. The variable of past year quit attempt was significantly associated with quit intention. This first model was significantly associated with quit intention, accounting for a significant 28.7% of the variance in scores;  $R^2 = 0.29, F(6,415) = 27.82, p < 0.001$ . The addition of self-efficacy, perceived risks and benefits, and social support added a further significant increase in variance, with an  $R^2$  change of 0.063,  $F(4,411) = 10.00, p < 0.001$ , adjusted  $R^2 = 0.334$ . The effect size attributable to the addition of the SCT constructs, as measured by Cohen's  $f^2$ , was small  $f^2 = 0.10$ . Within this model, self-efficacy, perceived benefits and social norms were significantly associated with quit intention. The full model of independent variables accounted for 35% of the variance in quit intention (Table 3).

**Table 3.** Hierarchical Multiple Regression Examining Quit Intention and Gender, Educational Attainment, Past Year Quit Attempt and SCT Constructs.

Variable	Quit Intention							
	Model 1				Model 2			
	B	SE	$\beta$	95% CI	B	SE	$\beta$	95% CI
Constant	1.76	0.44	-	[0.89, 2.62]	1.40	1.44	-	[1.43, 4.22]
Gender: Other (Ref: Female)	-0.40	0.30	-0.06	[-0.99, 0.19]	-0.44	0.29	-0.06	[-1.01, 0.13]
Gender: Male (Ref: Female)	-0.43	0.26	-0.07	[0.95, 0.08]	-0.32	0.27	-0.05	[-0.85, 0.20]
Educational Attainment $\leq$ Yr11	-0.55	0.49	-0.06	[-1.50, 0.40]	-0.62	0.47	-0.06	[-1.54, 0.31]
Educational Attainment $\geq$ Yr12	-0.14	0.31	-0.03	[-0.75, 0.48]	-0.22	0.31	-0.05	[-0.82, 0.38]
Post School Certificate/Diploma	-0.54	0.34	-0.10	[-1.21, 0.14]	-0.43	0.33	-0.08	[-1.08, 0.23]
Past Year Quit Attempt	2.49	0.20	0.51 ***	[2.09, 2.89]	2.30	0.21	0.47 ***	[1.90, 2.70]
Self-efficacy					0.15	0.04	0.16 ***	[0.07, 0.22]
Perceived Risks					0.29	0.18	0.08	[-0.06, 0.63]
Perceived Benefits					-0.26	0.13	-0.11 *	[-0.50, -0.01]
Social Norms					-0.25	0.12	-0.09 *	[-0.48, -0.02]
R <sup>2</sup> Adjusted	0.28				0.33			
F	27.82 ***				22.14 ***			
$\Delta$ R <sup>2</sup>	0.29				0.06			
$\Delta$ F	27.82				10.00			

Note.  $N = 422$ . \*  $p < 0.05$ , \*\*\*  $p < 0.001$ .

#### 4. Discussion

The current study identified associations between SCT constructs and young adults' vaping quit intention, providing insight into specific factors that may influence the quitting process. The constructs of self-efficacy, perceived benefits and social norms were significantly associated with quit intention in this sample, facilitating our understanding of vaping cessation and identifying areas for behavioural interventions to focus on. The study adds to the growing body of research on vaping cessation as one of the most comprehensive studies contributing to the limited literature incorporating all three SCT domains [34,35]. Our empirical findings demonstrate that SCT is a suitable framework for the development of vaping cessation programs, addressing the call for vaping cessation research to test conceptual framework suitability and effectiveness [10].

Effective vaping cessation support is important, given quitting is often not successful the first time [36], demonstrated in our findings by almost two-thirds of the sample reporting a past year quit attempt. The association of this quit attempt with quit intention was significant, corroborating previous research findings [15,20]. The initial bivariate analysis also revealed some insights regarding gender, with females reporting a significantly higher quit intention score than males. This contrasts with previous e-cigarette research reporting no association between quit intention and gender [15,20], and a lower intention to quit in females [14]. This may be due to different perceptions of health risks by female e-cigarette users [37], or differences in nicotine use and effects [38]. This warrants further qualitative research to provide insights into the different experiences and motivations between genders when considering quitting vaping. This will help us understand if targeted strategies specific to different genders are required. Vaping cessation programs should, however, target all levels of vaping frequency, with our analysis finding no association for this variable with intention to quit, in contrast to previous research [15].

Examination of the behavioural, personal and environmental SCT constructs identified three key areas for consideration in the development of vaping cessation support. Firstly, self-efficacy was found to be significantly associated with quit intention in this study and should be a central component of vaping cessation support programs. While greater self-efficacy has previously been demonstrated to be associated with vaping quit attempts and cessation outcomes, vaping cessation was more likely among dual smokers who continued smoking [35]. Lower self-efficacy among vapers was reported when comparing quit intention to smokers or dual users [23], suggesting different cognitive processes by people who exclusively vape. Ultimately, the aim of tobacco or nicotine cessation must be



complete cessation [39], therefore incorporating strategies to increase self-efficacy for all users is important in optimising the efficacy of future attempts. There is limited evidence of vaping cessation outcomes from interventions incorporating self-efficacy strategies [40], however, program development may be informed by existing behavioural change research from smoking cessation [41].

Secondly, adding the SCT construct of perceptions of e-cigarettes to the second regression model showed that perceived benefits of e-cigarettes were significantly associated with a lower intention to quit. However, perceived risks did not add significant variation, in contrast to previous research [20]. This highlights an area of concern for behavioural change interventions to address. Research has demonstrated that many young adult e-cigarette users report the benefits of use [24] and are not aware of health or dependency risks [16]. They perceive e-cigarettes to be less harmful [18], a more attractive alternative to smoking or a potential smoking cessation aid [12]. Our participants reported a higher mean score of perceived risks compared to benefits, suggesting that they are aware of the risks of vaping but that this is not a factor that shapes their intention to quit. This could also reflect the measure of their dependence on nicotine vaping, which may overpower any perception of risks to health or their ability to change behaviour. The fact that quitting intention is impacted by such benefit perceptions demonstrates the importance of vaping cessation programs incorporating up-to-date educational components and evidence-based health messaging. This may augment an individual's knowledge to make informed decisions and empower them in the quitting process. This, in turn, highlights the need for continued scientific data collection on the health impacts of vaping and the importance of a precautionary approach to vaping regulation to minimise e-cigarette uptake [42].

Finally, the social acceptability of vaping appears to be a factor influencing young adults' intention to quit, with the perceived approval or encouragement of vaping by family, friends and the community being associated with a lower quit intention in this sample. This contrasts with previous research, which found no significant association between subjective social norms and quit intention [20], or perceived disapproval of e-cigarette use with interest in quitting [20]. Our findings indicate the power of social norms in influencing vaping behaviours, as has previously been demonstrated with vaping initiation [43,44] and the association of higher use of e-cigarettes in US populations [31]. Therefore, in order to discourage the uptake of vaping and facilitate quit intention, vaping cessation programs and public health campaigns need to de-normalise vaping as was previously successful with cigarette smoking [45].

Nonetheless, the finding on social norms in our study should be interpreted with some caution, as the internal reliability of the scale was deemed 'adequate' in the initial analysis, as opposed to 'high'. Current vaping trends and policies are evolving at a rapid pace, with previous research suggesting regulatory environments appear to contribute to ambiguity around the social acceptability of vaping [46]. This may explain the degree of variation among respondents for this measure.

The empirical findings offer insight for practical strategies to incorporate SCT constructs into vaping cessation programs. Social support for young people is critical to build confidence in their ability to consider vaping cessation, coupled with educational components that inform of the potential health risks. To be most effective, participatory research engaging young adults as the end user is needed, to explore what vaping cessation strategies are required with this population [47].

#### *Limitations and Recommendations for Future Research*

The cross-sectional nature of this study restricts the analysis of data to a single time point, and therefore future research might consider a longitudinal approach to further facilitate our understanding of quit intentions and the directionality of associations. Our study is also subject to limitations associated with the use of a convenience sample, predominantly recruited via social media, potentially exposing the data to self-selection bias and with a low prevalence of males. The findings may, therefore, not be generalisable to the target

population. A strength of the current sample, however, was that it consisted of a broader young adult sample than many ‘university student’ samples, with 36% of the current sample not currently enrolled in study, potentially better representing the diversity of the target population. Online surveys may also be prone to misleading or fraudulent responses [48]. However, this was methodologically addressed in this study with LimeSurvey functions such as blocking malicious bots and time stamps for responses [48].

The analysis includes data from both current vapers and dual vapers/smokers; it may be prudent to examine further the differences between those that vape and dual vapers/smokers to identify differences in smoking behaviours or nicotine dependence. Finally, the low reliability of the social norms scale is a limitation and may reflect the ambiguity of this construct within the current e-cigarette regulatory climate in Australia. Future research may consider incorporating additional measures to test this construct.

## 5. Conclusions

The findings suggest that SCT is an effective framework for use in the development of vaping cessation programs, with our empirical data highlighting key factors for consideration, contributing to the growing evidence surrounding SCT and vaping quit intentions. The inclusion of all three domains of SCT has identified key factors associated with vapers’ quit intentions, indicating practical implications for vaping cessation practice. Incorporating strategies to build an individual’s self-efficacy to quit, increase awareness of the risks of e-cigarette use and de-normalising vaping behaviours may encourage and better support individuals to quit.

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