Evaluative conditioning can change explicit attitudes towards smoking behaviour but does self-efficacy act as a moderator?

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ABSTRACT

Cigarette smoking is an addictive behavior and research on effective treatment approaches that can decrease the odds of relapse during smoking cessation intervention is crucial. In two studies, we investigated the effects of evaluative conditioning on smoking behaviour attitude change and tested if self-efficacy moderates the relationship. Fifty male undergraduates (Mean age = 23.70, SD = 24.10) participated in each study. Self-report measures were used to collect data for the attitudes and behaviour change as well as the self-efficacy scores of the participants. An experimental approach was adopted. Participants were randomly assigned to the experimental and baseline treatments using the between subject design. Results showed that a significant effect of evaluative conditioning on all the smoking behaviour attitudes. Findings revealed that self-efficacy both predicted smoking behaviour change and moderated its link with evaluative conditioning, indicating that evaluative conditioning can change attitudes towards smoking by associating smoking-related cues with negative stimuli. These findings further highlight the importance of incorporating self-efficacy-enhancing strategies in smoking cessation programs to improve their effectiveness and sustainability in the Nigerian context.

Introduction

Cigarette smoking is one of those behaviours that adversely affect human health, and which has in recent times been ranked among the biggest global public health threats – being responsible for more than 8 million deaths annually (WHO, 2020). Out of these, over 7 million deaths are due to direct tobacco use, while around 1.3 million deaths are attributed to non-smokers being exposed to second-hand smoke (Ritchie & Roser, 2023; WHO, 2020). Despite the ongoing efforts and progress in tobacco control worldwide, there isneed for accelerated actions to protect people from the harms of tobacco and second-hand smoke (WHO, 2023a, b).

The global prevalence of cigarette smoking has shown varied trends over recent years, with some regions experiencing increases while others see declines. For instance, a study found that smoking prevalence has increased in certain low and middle-income countries, despite global efforts to reduce smoking rates (De Silva et al., 2024). The prevalence of cigarette smoking among women has increased globally, especiallyin regions like Oceania, Europe, and Africa (Abeysekera et al., 2024),highlighting the need for targeted interventions in these regions (Dai et al., 2024). Cigarette smoking among 18-21 year olds ranged from 16% to 30% (Messeri et al., 2019) and in Nigeria, the prevalence varies significantly across different regions ranging from 0.2% to 32.5% (Oyewole et al., Ethelbert C. Agu, 2018). For instance, the North-East region had the highest prevalence, with rates as high as 32.1% for current smokers. In contrast, the North-West region reported a lower prevalence of 5.4% for current smokers. The pooled crude prevalence of current smokers among young people in Nigeria was 10.4%, with higher rates among males compared to females (Adeloye et al., 2019).

Notwithstanding the dangers of smoking and measures taken by government and non-governmental organizations to control tobacco consumption the alarming increase in the global prevalence of smoking has generated concerns among scholars and health providers. One reason for this trend despite health warnings of cigarette smoking (Ezeh &Mefoh, 2015)can be found in how youthsperceive smoking in Nigeria. For instance, 28% of young people think that girls who smoke and 45% think that boys who smoke have more friends; while 17% think that boys who smoke and 16% think that girls who smoke look more attractive (United State for Disease Control, 2001). Cigarette smoking is thus seen by young people as something exciting and desirable (Odigwe, 2003) and which may largely play a significant role in shaping their attitudes towards smoking.

Compelling evidence has shown that smoking attitudes have strong effect on several aspects of smoking behaviour such as initiation, sustenance and intention to quit smoking. Students who have negative attitude toward smoking are reported to show low tendency to initiate smoking at a young age (Berg et al., 2011; Xu et

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al., 2016) and have smoking cessation ideas (Xu et al., 2015). For example, studies using self-report measures revealed that smokers' general attitude toward smoking is negative rather than positive (Houwer et al., 2006; Swanson et al., 2001).

From the framework of health behaviour theories attitudes are important determinant of intention and behaviour and research has shown that inducing changes in attitudes led to changes in intention and produced changes in behaviour (see Sheeran et al., 2016). Most attitude-behaviour relationship research has been carried out within the framework of the theory of reasoned action and by extension theory of planned behaviour (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) with the conceptualization that attitudes in some way guide, influence, direct, shape, or predict actual behaviour (Ajzen & Fishbein, 1974; Kraus, 1995).Ajzen (1991) posits that intentions to perform behaviours of different kinds can be predicted with high accuracy from attitudes toward the behaviour, subjective norms, and perceived behavioural control, and these intentions, together with perceptions of behavioural control, account for considerable variance in actual behaviour. Thus, behavioural achievement or change depends on both motivation (intention) and ability (behavioural control). With a strong positive relationship between attitudes and actual behaviour, there is an increasing interest among smoking researchers to finding ways to change attitude towards smoking with the aim of changing actual smoking behaviour.

Behaviour change has continued to feature in health promotion issues. This is because behaviours that are debilitating to health require that the person engage in behavioural change. One of the ways to achieve behaviour change that has featured in the literature is through evaluative conditioning (Li et al., 2021; Olson &Mcnulty, 2025; Waroquier et al., 2020).

Evaluative conditioning (EC) is generally considered as a change in the valence of a stimulus that results from pairing the stimulus with another stimulus (De Houwer, 2007) or attitude formation (or change) due to an object's pairing with positively or negatively valenced stimuli (Jones et al., 2010). For example, it has been demonstrated that the liking of a stimulus can be increased by pairing it with positive stimuli and decreased by pairing it with negative stimuli (Hofmann et al., 2010). One approach to EC is therefore the pairing of a neutral stimulus (conditioned stimulus, CS) such as a cigarette brand with an aversive stimulus (unconditioned stimulus, US) such as image of a cancerous lips in other to decrease the liking to smoke (Măgurean, 2016). Experimental research conducted in laboratory settings suggests that different aspects of attitudes could be changed using EC and the paradigm has been widely used with various kinds of stimuli and procedures. For example, EC has been used to change a wide range of behaviours such as attitudes towards the self/body image (Masselman et al., 2022) and to decrease body dissatisfaction and increase self-esteem (Glashouwer et al., 2019).

The aim of this study is to examine the use of EC to change several aspects of explicit attitudes towards smoking. Specifically, the study examines the use of EC to change general attitude towards smoking behaviour (ATSB), attitude towards smoking behaviour change, self-identity towards smoking behaviour change, perceived control over smoking behaviour and intention towards smoking behaviour change. Attitude towards smoking behaviour change (ATSBC) deals with the relationship between attitude and behaviour change since attitude change is a necessary instrument for behaviour change (Bettinghaus, 1986; Ajzen & Fishbein, 1980). Self-identity is the interpretation of a person about self. People think of themselves in terms of social roles (e.g., parent, employee) and self-identity reflects the values and behaviours that are associated with these roles which are more self-defining than others (Stets, 2006). Thus, the more central a certain role is to someone's self-identity, the more likely that the behaviours associated with this role will be performed and the more often people perform a certain behaviour, the more this behaviour becomes part of their self-identity (Trucharteet al., 2024).

PCOSB denotes an individual's perceived ease or difficulty in performing a particular behaviour (Ajzen, 1991). Perceived behavioural control is determined by the total set of accessible control belief about the presence of factors that may facilitate or hamper performance of the behaviour (Ajzen, 2001) and is conceptually related to self-efficacy since it reflects a person's self-confidence in the ability to conduct the behaviour (Ajzen, 1991). The behaviour under consideration must therefore be under volitional control (Fishbein & Ajzen, 1975) and which connotes that behaviour may be said to be completely under a person's control if the person can decide at will to perform it or not.

Intention towards smoking behaviour change (ITSBC) is an indication of an individual's readiness to perform a given behaviour which is an antecedent of such behaviour (Ajzen, 2002). According to Ajzen and Fishbein (1980), intention to perform a particular behaviour is the highest determinant of that behaviour and intention in turn, depends on an individual's attitude toward the behaviour. In the case of smoking however, people will have strong intentions to smoke if they view smoking favourably and believe that others who are important to them think that they should smoke. As such, attitude depends upon the intention, population and the individual in question (Sutton, 1989). Ajzen (1985) gave credit to the fact that the formation of intentions to act may also be influenced by aspects that are not under a person's volitional control. Considering that intention to perform a particular behaviour is the single best determinant of that behaviour, anybody that engages in smoking must have conceived the intention to do so.

In this study, we tried to find out whether we can use EC to change smokers' attitudes towards smoking, attitude towards behaviour change, self-identity towards behaviour change, perceived control over behaviour and intention towards behaviour change ina Nigerian sample. There is also the need to explore

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further on associations between EC and smoking behaviour and we argue that it is likely certain socio-cognitive factors such as self-efficacy may help explain the pathway through which EC affects smoking behaviour.

Self-efficacy is the belief in one's ability to complete a given task (Ormrod, 2006). It has several effects on thought patterns and responses such that low self-efficacy can lead people to think of a task to be harder than they actually are (Bandura, 1977). It also motivates human behaviour in both positive and negative ways. Thus, the higher the person's self-efficacy, the more active his efforts become and thus explains the connection between human decisions and the ability to engage in and accomplish any given behaviour. Research shows that when the optimum level of self-efficacy is slightly above ability, people are encouraged to tackle challenging tasks and gain experience (Csikszentmihalyi, 1997).

Self-efficacy can therefore be viewed as an explanatory variable in the decision to make positive health related choices such as in smoking, dieting and condom use (Alshaikh et al., 2024; Bektas et al., 2021; Dolatabadi et al., 2022).This implies that a person's self-efficacy beliefs are cognitions that determine whether health behaviour change will be initiated. It thus predicts behavioural intentions and can help prevent relapse to unhealthy behaviours(Moniz-Lewis et al., 2022; Susanti et al, 2024).Studies suggest that self-efficacy can influence both attitudes toward smoking and actual smoking behaviour. Higher self-efficacy is associated with more negative attitudes toward smoking and a greater likelihood of intending to quit, while lower self-efficacy often coincides with more permissive attitudes and less intention to stop smoking (Pardavila-Belio et al., 2019). Self-efficacy has been found to be a key psychological factor that shapes both attitudes toward smoking and the likelihood of quitting, making it a valuable target for prevention and cessation programs (Buitenhuis et al., 2021; Hopkins et al., 2022).

EC is one potential way of creating and changing likes and dislikes after pairing of stimuli and is generally considered to be one of the routes via which likes and dislikes are acquired. EC can therefore be seen as a learning process where the learner is expected to change his/her like or dislike for certain behaviour in the event of conditioning. Taking a decision is a cognitive function and evidence has shown a higher perceived self-efficacy influencesassociative learning viaconditioning (Raeder et al., 2019). Thus, assessing the moderating role of self-efficacy beliefs on the relationship between EC and smoking behaviour might be of special importance that can help in understanding and controlling aspects of human behaviour especially smoking behaviour. Two studies were conducted. Study 1 tested the effect of EC on smoking attitudes and Study 2 tested the moderating effect of self-efficacy on the relationship between EC and smoking behaviour.

Study 1

Participants

Fifty male undergraduate students of University of Nigeria, Nsukka participated in this study. The participants were volunteers who are current smokers and had smoked for at least one year. The participant's ages ranged from 18 to 30 years with a mean age of 23.70 (*SD* = 3.80). The favorite cigarettes for all participants were Benson & Hedges and Dorchester.

Measures

Attitude towards smoking behaviour

Attitude towards smoking behaviour was measured using the Attitude towards Smoking Behaviour Scale (ATSBS: Van den Pulte, et al., 2009). The ATSBS is a six evaluative semantic differential scale where participants responded to items like, "my quitting smoking within the next 3 months is…" by assigning a value along a 7-point opposing adjectives such as "unwise - wise; bad - good; unpleasant - pleasant; harmful - harmless; unenjoyable - enjoyable; negative - positive". Van den Pulte et al. (2009) reported internal consistency reliability(α)of .84 for ATSBS. In the current study, an α of.87 was obtained indicating a high internal consistency. The higher the score the more positive the attitude towards smoking.

Attitude towards smoking behaviour change

Attitude towards behaviour change was measured using a four-item Attitude towards Behaviour Change Scale (ATSBCS: Armitage & Conner, 1999). Participants were asked to respond by assigning values to items like "not smoking in the next 2 weeks to me would be…" on a 7-point semantic differential scale ranging from 1-unpleasant to 7-pleasant. Previous research has supported the concurrent validity of the attitude constructs with indirect, belief-based measures of attitude. The median average Cronbach αfor the attitude measure was found to be satisfactory (α = .84) (Armitage & Conner, 1999). An internal consistencyreliability of (α) .82) was obtained in the present study. The higher the score the more positive the attitude towards smoking behaviour change.

Self-Identity towards smoking behaviour change

Self-identity towards behaviour change was measured using the Self-Identity towards Smoking Behaviour Change Scale (SITSBCS: Armitage & Conner, 1999). The scale has four items that were placed on a 7–point semantic differential scale ranging from 1-strongly agree to 7-strongly disagree. An example of the items in the scale is "Smoking in the next 2 weeks is an important part of who I am". The average alpha reliability of this scale was acceptable (α = .93) (Armitage & Conner, 1999). An internal consistencyreliability (α)of .71 was obtained in the current study. The higher the score, the more a participant's self-identity is tied towards smoking behaviour change.

Perceived control over smoking behaviour

A single item Perceived Control over Smoking Behaviour Scale (PCOSBS: Ajzen, 2013) was used to measure perceived control over smoking behaviour. Participants are asked to indicate on a 7-point semantic differential scale, ranging from *1-very difficult* to *7-very easy* the extent to which they are in control of quitting smoking by responding to the item "I have the feeling

that quitting to smoke is completely in my control the next month". The higher the score the more a participant perceives control over smoking behaviour.

Intention towards smoking behaviour change

Intention towards Smoking Behaviour Change Scale (ITSBCS: Ajzen, 2013) was used to measure intention towards behaviour change. The ITSBS is a 3-item scale where participants are asked to indicate on a 7-point semantic differential scale ranging from 1- extremely unlikely to 7- extremely likely the extent to which they intend to engage in smoking in the next month. An example of an item is "I plan to quit smoking in the next month". The average internal consistency of this scale was satisfactory (α = .84) (Ajzen, 2013). An internal consistencyreliability (α)of .84 was obtained in the current study. The higher the score, the more the intention towards smoking behaviour change.

Procedure

Fifty participants were randomly selected and equally assigned to either the EC condition (Pairing of images of cigarette with aversive images of potential health consequences) or control condition (Pairing of images of cigarette with blank screen).

Table 1: Mean of baseline scores (pre-test) for EC and control conditions on attitudes towards smoking behaviour.

Outcome	EC (*M*)	Control (*M*)	Sig. *t*
ATSB	26.8	25.8	.380
ATSBC	16.4	17.0	.585
SITSBC	16.4	17.5	.280
PCOSB	3.7	4.4	.097
ITSBC	12.1	12.1	.967

Note: ATSB = Attitude towards smoking behaviour; ATSBC = Attitude towards smoking behaviour change; SITSBC = Self-identity towards smoking behaviour change; PCOSB = Perceived control over smoking behaviour; ITSBC = Intention towards smoking behaviour change.

T-test was used to compare baseline scores on attitudes towards smoking between the EC and the control conditions. This is to examine whether differences exist between the two conditions prior to EC intervention. Table 1 revealed a non-significant difference in all attitude dimensions for both conditions: ATSB [t = -.886, df = 48, p = .380]; ATSBC [t = .550, df = 48, p = .585]; SITSBC [t = 1.092, df = 48, p = .280]; PCOSB [t = 1.691, df = 48, p = .097]; and ITSBC [t = -.042, df = 48, p = .967].

Before EC manipulation, base line attitude scores were determined by administering the five attitude scales to the participants in both conditions. After the base line task participants in the EC condition were shown two images of cigarettes with their packets (Benson & Hedges and Dorchester) projected on a screen 12 times in a random order. Each cigarette image appeared for two seconds followed by the presentation of one of two smoking aversive images for two seconds. For participants in the control condition, each cigarette image appeared for two seconds followed by a blank screen for two seconds. The smoking aversive images used were two images of a smoke damaged teeth gum and skin. These have been reported to be highly related to cigarette smoking. As a distraction task, participants were given a puzzle game and were asked to form five letter words each with letters "U, Y,Z". This is to allow the stimulus presentation to slither into the unconscious (Ezeh &Mefoh, 2015). To obtain the post EC manipulation scores, participants were again administered the five smoking attitude scales.

Results

Multivariate Analysis of Covariance (MANCOVA) was used to analyze the data generated. The independent variable was EC (EC vs control) while five dimensions of attitude were

Table 2: Descriptive statistics for effect of EC (post-test scores) on attitude towards smoking behaviour.

Outcome	EC (*M*)	Mean	*SD*	N
ATSB	EC Group	27.6	3.2	25
	Control	34.8	6.1	25
ATSBC	EC Group	23.6	2.9	25
	Control	15.4	3.8	25
SITSBC	EC Group	23.7	2.9	25
	Control	15.8	4.0	25
PCOSB	EC Group	5.9	1.3	25
	Control	4.0	1.0	25
ITSBC	EC Group	18.9	1.7	25
	Control	11.2	2.8	25

Note: ATSB = Attitude towards smoking behaviour; ATSBC = Attitude towards smoking behaviour change; SITSBC = Self-identity towards smoking behaviour change; PCOSB = Perceived control over smoking behaviour; ITSBC = Intention towards

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smoking behaviour change.

Table 2 shows the mean attitudes toward smoking behaviour after EC intervention. For attitude towards smoking behaviour the mean was lower for EC condition than the control group but for all other attitude dimensions those in the EC condition had higher mean than the control. The MANCOVA Table of test of between subject effects with baseline scores as covariates is shown in Table 3 below.

Table 3: MANCOVA test of between subject effects with baseline scores as covariates

SOV	DV	SS	df	MS	F
EC	ATSB	593.7	1	593.7	25.3*
	ATSBC	876.0	1	876.0	72.8*
	SITSBC	792.9	1	792.9	66.7*
	PCOSB	53.9	1	53.9	43.7*
	ITSBC	670.8	1	670.8	125.2*
Error	ATSB	1007.4	43	23.4	
	ATSBC	517.1	43	12.0	
	SITSBC	511.3	43	11.9	
	PCOSB	52.9	43	1.2	
	ITSBC	230.3	43	5.4	
Total	ATSB	50389.0	50		
	ATSBC	20532.0	50		
	SITSBC	20902.0	50		
	PCOSB	1362.0	50		
	ITSBC	12407.0	50		
C. Total	ATSB	1779.4	49		
	ATSBC	1402.3	49		
	SITSBC	1379.1	49		
	PCOSB	112.0	49		
	ITSBC	1006.5	49		

Note: Note: ATSB = Attitude towards smoking behaviour; ATSBC = Attitude towards smoking behaviour change; SITSBC = Self-identity towards smoking behaviour change; PCOSB = Perceived control over smoking behaviour; ITSBC = Intention towards smoking behaviour change; C. Total = Corrected Total; * = $p<.001$

After controlling for baseline scores the result of MANCOVA indicates a significant effect of EC on ATSB [$F(1, 43) = 25.3$, p<.001] with participants in the EC condition having significantly more negative attitude than control following EC intervention. There was also a significant effect of EC on ATSBC [$F(1, 43) = 72.8$, p<.001], EC on SITSBC [$F(1, 43) = 66.70$, p<.001], EC on PCOSB [$F(1, 43) = 43.7$, p<.001] and EC on ITSBC [$F(1, 43) = 125.2$, p<.001]. Participants in the EC condition had more positive attitude towards smoking behaviour change, had higher self-identity towards smoking behaviour change, had higher perceived control over smoking behaviour and higher intension towards smoking behaviour change than the control.

Study 2

Participants
The same sample from study 1 participated in study 2.
Measures
Measure of Self-Efficacy
The General Self-Efficacy Scale (GSES: Schwartzer & Jerusalem, 1995) was used to measure self-efficacy. It is 10-item scale placed on a 4-point Likert type ranging from "Not at all true" (1) to "Exactly true" (4). The score for each of the ten items were summed to give a total score. For administration, this was a self-administered scale which normally takes two to three minutes to complete. It was used to identify whether one's ability to respond to and control environmental demands and challenges will affect their smoking behaviour. The total score ranges between 10 and 40 with a higher score indicating higher self-efficacy. Schwartzer and Jerusalem (1995) reported internal reliability (α) of between α= .76 and .90 for GSES. An αcoefficient of .71 was obtained for the current study.

Measure of smoking behaviour
Smoking choice task was used to measure smoking behaviour. After the experiment, participants in both conditions were presented with two packets each of Benson & Hedges and Dorchester cigarettes and a lighter and were told that they were free to pick a cigarette of their choice if they choose to smoke. Participants were not allowed to light the cigarette. If they chose to take a cigarette to smoke, they were given a score of 1; if they chose not to take a cigarette to smoke, they were given a score of 2.

Procedure
Equal number of participants (25 each) were assigned to the two conditions as in Study 1. For base line smoking choice both groups were presented with two packets each of Benson & Hedges and Dorchester cigarettes and a lighter and were told that the experiment will start in 10 minutes' time and they were free to pick a cigarette of their choice if they choose to smoke while waiting. The number of those who chose to smoke (which defines the base line smoking choice) was recorded for both groups. The EC

manipulation was done as in Study 1. To obtain the post EC manipulation smoking choice, participants were again presented with two packets each of Benson & Hedges and Dorchester cigarettes and a lighter and were told that they were free to pick a cigarette of their choice if they choose to smoke while they wait for the second phase of the experiment that will commence in another 10 minutes' time.

Results

To examine whether EC predicts smoking behaviour and whether self-efficacy will moderate the relationship between EC and smoking behaviour, moderated logistic regression analysis was conducted. At pretest (base line scores), 21(84%) of those in EC condition and 19(76%) of those in control condition chose to smoke. This difference was not significant $\chi 2$ (1, $N = 40$) = .10, p = .752. Moderated logistic regression analysis was conducted to test the hypotheses because the dependent variable (smoking behaviour) was dichotomous (i.e. choosing to smoke and choosing not to smoke). Table 4 summarizes the descriptive characteristics of the participants.

Table 4: Descriptive characteristics of the participants

	EC	Control
Sample (*n*)	25	25
Chose to smoke	6	18
Chose not to smoke	19	7

Table 4 shows that those in the EC condition chose not to smoke more than those in the control condition. Prior to analysis, all continuous variables were centered. A one- predictor and one-moderator binary logistic regression model was fitted to the data to determine whether EC (intervention vs. control) predicts smoking behaviour and whether self-efficacy will moderate the relationship between EC and smoking behaviour. Given the base rates of smoking options for a model that includes only the constant (intercept), 24% of the participants chose to smoke while 26% chose not to smoke. A test of the full model versus a model with constant only showed that the model fits the data and was statistically significant in distinguishing between choosing to smoke and choosing not to smoke, – 2 Log Likelihood = 46.39, Goodness of Fit = 4.05 (*df*= 7, p = .774), $\chi 2$ (3, $N = 50$) = 22.84, p <.001. The model was able to classify 92.3% of those who chose not to smoke and 66.7% of those who chose to smoke, for an overall success rate of 80%.

Logistic regression coefficients are presented in Table 5. Wald statistics indicate that EC significantly predicts smoking behaviour (*Wald* = 6.00, *df*= 1, p = <.01). The coefficient of the EC predictor was negative (–1.754), indicating that those in the EC group were predicted to choose not to smoke with greater probability than the control group. Specifically, the odd ratio ($e\beta$) was found to be .15 which implies that as EC increases by 1, participants in the EC condition are 1/0.15 = 6.67 times more likely to choose not to smoke than are participants in the control condition. Self-efficacy was also found to predict smoking behaviour (*Wald* statistics = 5.69, *df*= 1, p = <.05). The interaction term between EC and self-efficacy was also significant (*Wald* statistics = 3.87, *df*= 1, p = <.05) indicating that Self efficacy significantly moderated the relationship between EC and smoking behaviour. Figure 1 below shows the slope. The negative weight for this interaction means that the slope of the relationship is less positive for EC condition (0) and more positive for control condition (1). Specifically, the modality effect was larger for participants in the EC condition who held high self-efficacy.

Table 5: Moderated logistic regression coefficient

Predictor	B	*SE*β	*Wald's* $\chi 2$	df	p	eβ (Odds Ratio)
Constant	1.10	.50	4.94	1	.026	3.01
EC	-1.90	.77	6.00**	1	.014	.15
SE	.38	.16	5.69*	1	.017	1.47
EC*SE	-.18	.09	-3.87*	1	.049	.833

Note: EC = Evaluative conditioning; SE = Self-efficacy; ** = <.01; * = <.05.

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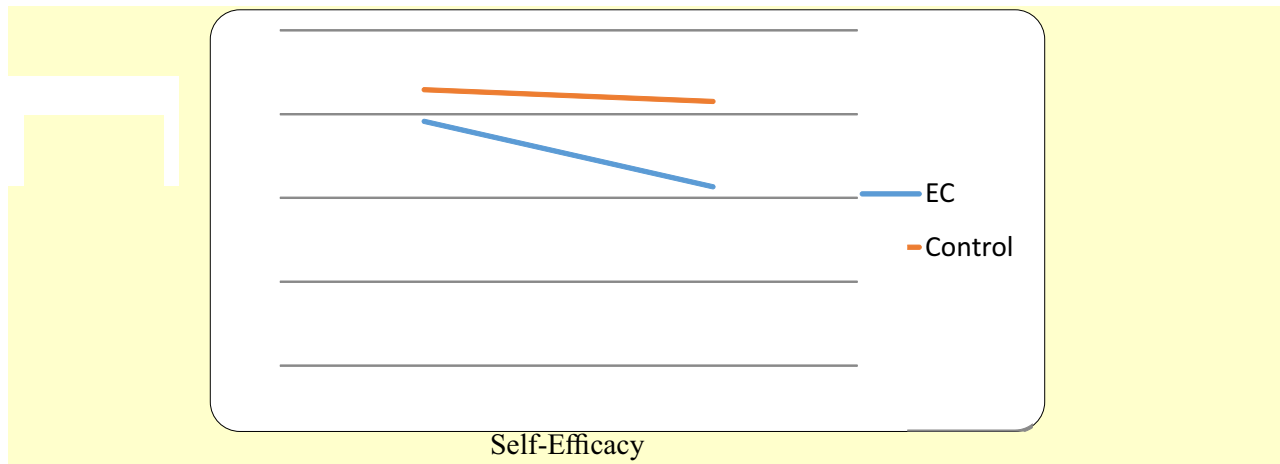
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Figure 1: *Figure showing plot for moderation effect.*

Discussion

We investigated in two studies whether evaluative conditioning can change explicit attitudes towards smoking behavior and tested if self-efficacy can act as a moderator. The results indicated that there was a significant effect of evaluative conditioning on all the smoking attitudes. These attitudes include: attitude towards smoking behaviour; attitude towards smoking behavior change; self-identity towards smoking behaviour change; perceived control over smoking behaviour and intention towards smoking behaviour change. Notably, participants in the evaluative conditioning group had higher mean scores in all measures but attitudes towards smoking behaviour. This indicates that most of them still have good opinions about smoking but are willing to change. This contradicts the findings of Măgurean and Sava (2016) and Yoon (2023) which foundthat evaluative conditioning affects implicit attitudes towards smoking, which in turn influences explicit attitudes.

However, the results also align with previous findings on smoking behaviour change through evaluative conditioning. For instance, research indicates that evaluative conditioning can change attitudes towards smoking by associating smoking-related cues with negative stimuli (e.g., Magurean et al., 2016). This can reduce the appeal of smoking and support smoking cessation efforts. Again, behaviour change interventions, which often include evaluative conditioning components, are effective in promoting smoking cessation (Minian et al., 2020; Dijkstra &Buunk, 2008). These interventions work by altering attitudes, increasing motivation, and providing support for behaviour change (Khanal et al., 2023). The results also align with the theory of planned behavior (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), which includes attitude change as a key component, and has been used to design interventions that incorporate evaluative conditioning. These interventions have been shown to be effective in reducing (Khanal et al., 2023).

The findings are plausible because evaluative conditioning affects attitudes towards smoking behaviour change by altering the emotional responses associated with smoking-related cues. For example, when smokers are repeatedly exposed to negative images paired with smoking cues, their attitudes towards smoking become more negative, which can lead to a decrease in smoking behaviour.

Furthermore, the study also found that self-efficacy both predicted smoking behavior change and moderated its link with evaluative conditioning such that those high on self-efficacy showed higher inclination not to smoke against those who did the opposite. Research has shown that individuals with higher self-efficacy are more likely to successfully quit smoking (Gwaltney et al., 2009; Lindberg et al., 2015; Perkins et al., 2012). However, it is also important to note that while self-efficacy is a strong predictor of smoking cessation, it may not always directly influence the intention to quit. Studies suggest that high self-efficacy can sometimes weaken the intention to quit by reducing the perceived risks associated with smoking (e.g.,Poggiolini, 2019).

These results have several implications. Evaluative conditioning can be a powerful tool in smoking cessation efforts in the context of a low-income country like Nigeria. EC can be effective across various populations, including those in low- and middle-income countries (LMICs), and psychosocial interventions, including EC, showed promise in promoting smoking cessation.The success of EC in Nigeria would depend on the availability and accessibility of healthcare services. Implementing EC would require training healthcare providers and integrating these techniques into existing health programmes. Cultural attitudes towards smoking and cessation can influence the effectiveness of EC. In Nigeria, where smoking prevalence varies significantly across regions and demographics (Adeloye et al., 2019), tailored EC interventions that consider local cultural and social norms could enhance effectiveness. Effective tobacco control policies are crucial for the success of any cessation program. The literature emphasizes the importance of strict anti-tobacco laws and comprehensive measures to reduce smoking rates (Adeloye et al., 2019). ECinterventions would benefit from being part of a broader tobacco control strategy that includes

policy support.

The findings also imply that high self-efficacy can enhance the effectiveness of interventions aimed at reducing smoking behaviour by strengthening an individual's confidence in their ability to resist smoking triggers. Individuals with higher self-efficacy are more likely to maintain smoking cessation over time. They are better equipped to handle stress and other factors that might otherwise lead to relapse. These established links in the current study role can help in designing more personalized smoking cessation programs. For instance, interventions can be tailored to boost self-efficacy through mastery experiences and coping strategies.

Limitations

We acknowledge that the study had some limitations. The use of self-report measures for data collection can result to response bias. Also, the limited sample size for each study can affect the validity of the results obtained. Another drawback is that the study considered only the short-term effects of EC and self-efficacy on smoking attitudes and behaviour change. Long-term effects of these conditions can be tested by conducting a longitudinal study.

Conclusion

In two studies we demonstrated that EC influences smokers' attitudes towards smoking cessation. Negative conditioning was effective in reducing positive attitudes towards smoking. Self-efficacy moderated the association between EC and attitudes towards smoking cessation, such that individuals with higher self-efficacy showed greater attitude change and reduction in smoking behavior compared to those with lower self-efficacy. These findings suggest that incorporating EC in smoking cessation programs, especially for individuals with high self-efficacy, could enhance the effectiveness of these interventions. Further studies are recommended to explore the long-term effects of EC and the potential for integrating other psychological factors to improve smoking cessation outcomes.

Declarations

Data availability statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Consent to Participate: Informed consent was obtained from all individual participants included in the study. Participants were informed about the purpose of the study, the procedures involved, and any potential risks or benefits. They were also assured that their participation was voluntary and that they could withdraw from the study at any time without any repercussions.

Consent to Publish: Consent to publish was obtained from all individual participants included in the study. Participants were informed about the potential for their data to be published in scientific journals, but that their privacy and confidentiality would be maintained.

Competing Interests: The authors declare that they have no competing interests.

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