International Journal of Mental Health and Addiction
https://doi.org/10.1007/s11469-022-00828-8

ORIGINAL ARTICLE

# Family Conflict and the Use of Conventional and Electronic Cigarettes in Adolescence: the Role of Impulsivity Traits

**D. Eslava[1] · C. Martínez-Vispo[2] · V. J. Villanueva-Blasco[3] · J. M. Errasti-Pérez[1] · S. Al-Halabí[1]**

Accepted: 13 April 2022


**Abstract**
Adolescents' use of tobacco is a worldwide problem due to the negative consequences on their physical and psychosocial development. One contextual variable related to tobacco use is family conflict. Previous research has suggested that the relationship between family conflict and tobacco use could be mediated by personality traits. The aim of this study is to examine the direct and indirect effects of family conflict on tobacco use (conventional and electronic cigarettes) through specific impulsivity constructs. The sample comprised 879 adolescents (56.4% male; *M*(*SD*)age = 14.25 (1.88) years). Multiple mediational analysis showed that there was no significant direct effect between family conflict and tobacco use; however, an indirect effect was found between family conflict and conventional cigarette use through sensation seeking and premeditation. With electronic cigarettes, a significant indirect effect was found via sensation seeking. These findings have implications in terms of prevention and treatment of tobacco use during adolescence.

**Keywords** Tobacco · Electronic cigarettes · Family conflict · Impulsivity · Adolescents

## Introduction

Tobacco use is a problem with particular social and clinical significance in the young population since nicotine exposure during this period affects the developing brain, especially those areas related to impulsivity, attention, and mood (U.S. Department of Health & Human Services, 2016). The World Health Organization (WHO, 2020) has stated that all forms of tobacco use are harmful, and previous studies have reported that both conventional cigarettes (CC) and electronic cigarettes (EC) use constitute a relevant public health concern due to their harmful effects on adolescents' development (Hrywna et al., 2020; Tobore, 2019).

✉ V. J. Villanueva-Blasco
vjvillanueva@universidadviu.com

[1] University of Oviedo, Oviedo, Spain

[2] Departament of Psychology, University of Valladolid, Valladolid, Spain

[3] Faculty of Health Sciences, Valencian International University, C/ Pintor Sorolla, 21, 46002 Valencia, Spain

Published online: 16 May 2022

In Europe, 20% of young people aged 15–24 currently smoke conventional cigarettes (CC) and at least 18% have tried ECs (Eurobarometer, 2021). In Spain, tobacco use is a major public health concern since among 14- to 18-year-olds, 26.7% report using CC in the previous month, and 9.8% report daily use. In addition, 14.9% of adolescents report using EC in the previous month (Observatorio Español de las Drogas y de las Adicciones, 2019).

Some contextual variables are associated with substance use during adolescence, including tobacco. Previous research shows the relevance of peer influence (Henneberger et al., 2021), socioeconomic status (Polanska et al., 2022), and family factors like permissive parental style, poor communication among family members, or parental substance use (Loke & Mak, 2013; Thomas et al., 2016). Focusing on the latter, family conflict is the most closely related to substance use (Best et al., 2014; Loke & Mak, 2013; Rajesh et al., 2015). Literature suggests that the distress family conflict can generate in adolescents (Casey & Jones, 2010; Luk et al., 2018) could be associated with substance use as a coping strategy (Cornellà-Font et al., 2020). However, scant research has explored personality variables that may mediate between family conflict and tobacco use, specifically with EC. For instance, Fernández-Artamendi et al. (2021) found that young people's internal discomfort tends to be externalized through personality characteristics related to their poor ability to regulate negative emotions. Cyders et al. (2016) indicate that impulsivity increases the likelihood of responding to negative emotions with risky behaviors, including substance use. Therefore, identifying mediators of the association between family conflict and smoking would be warranted to determine potential treatment and prevention targets.

A personality variable that could be mediating the relationship between family conflict and tobacco use is impulsivity (Kale et al., 2018). This personality variable is defined as "behavior without adequate thought, the tendency to act with less forethought than do most individuals of equal ability and knowledge, or a predisposition toward rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions" (International Society for Research on Impulsivity, 2019). Strickland & Johnson (2020) suggested that the concept of impulsivity includes several independent psychological constructs. Psychometric studies have shown that impulsive traits and behaviors are uncorrelated onto a single variable (Caswell et al., 2015). Research suggests that it would be more accurate to examine specific impulsivity constructs instead of using impulsivity as a single construct (Cyders et al., 2007; Whiteside & Lynam, 2001). These authors proposed a five-dimension model of impulsivity (negative urgency, positive urgency, sensation seeking, premeditation, and perseverance), which has gained both theoretical and empirical support (Wang et al., 2020). Following this model, such dimensions are not considered variations of impulsivity, but psychological processes that lead impulsive behavior (Whiteside & Lynam, 2001). Research has consistently found that these impulsive traits are related to adolescent conventional tobacco smoking (Bos et al., 2019). However, few studies have examined the relationship between specific impulsivity dimensions and EC use in adolescents. For instance, sensation seeking has been associated with greater odds of EC use in adolescents (Case, et al., 2017; Hoffmann, 2021), but other impulsivity dimensions have only been examined in adults (Kale et al., 2020).

As noted above, impulsivity traits could be mediating the relationship between family conflict and current tobacco use. In this vein, Trujillo et al. (2016) found that family conflict was not directly related to the frequency of drug use (alcohol and marijuana), but instead there was a significant indirect effect through sensation seeking. Moreover, Mlouki et al. (2021) also found a significant indirect effect of intrafamilial adverse childhood experiences and substance use, including tobacco use, through impulsivity.

To our knowledge, no studies have examined the role of impulsivity traits in the relationship between family conflict and different forms of current tobacco use, including CC and EC. Identifying these associations could deepen our understanding of adolescent tobacco use, as well as helping to identify variables that could be targeted by prevention programs, taking the role of new tobacco products (i.e., e-cigarettes) into account. Therefore, the present study aims to examine the mediating role of impulsivity variables between family conflict and adolescents' tobacco use as follows: (1) examining the direct and indirect effect of family conflict on CC use through impulsivity variables; and (2) examining the direct and indirect effect of family conflict on EC use through impulsivity variables.

## Method

This is a cross-sectional study, and the STROBE checklist can be consulted in the Supplementary material.

### Participants

The target population comprised 912 Spanish adolescents from two state-funded secondary schools in the east of Spain, Teruel, where most schools receive public funds (91.7%; EPDATA, 2021). Since, in Spain, the assignment of public school centers is made mainly by proximity to the parents' home or employment (Organic Law 3/2020, Boletín Oficial del Estado, 2020), the socio-economic profile of the participating students is heterogeneous. The inclusion criteria for participating in the study were (1) providing parents' or legal guardian's written informed consent and (2) being willing to participate. The vast majority (96%) of the total target population agreed to participate. Thus, the final study sample comprised 879 participants (56.4% male, *M*age = 14.25; *SD* = 1.88, range = 11–19).

### Instruments

A sociodemographic record form was used to collect age, sex, ethnicity, school year, and other school-related data. The following instruments were used to collect the remaining data for the study:

*Current conventional and electronic cigarette use Questionnaire* (from the survey ESTUDES 2012, Observatorio Español de las Drogas y de las Adicciones, 2014). Current tobacco use is measured using the question, "How often have you smoked tobacco (conventional cigarettes) in the last 30 days?" Items are rated on a 4-point Likert scale (from never to daily). Current e-cigarette use is measured using the question, "On how many of the last 30 days have you used electronic cigarettes?" Items are rated on a 7-point Likert scale (from 0 to 30 days).
*UPPS-P Impulsive Behavior Scale* (Cándido et al., 2012; Lynam et al., 2006). This is a self-report instrument evaluating five impulsivity constructs (negative urgency, positive urgency, sensation seeking. premeditation, and perseverance). It consists of 20 items, which are rated on a 4-point Likert scale, with higher scores indicating less impulsive behavior.
*EFE Evaluación Familiar Estratégica* (*Strategic Family Evaluation*) (Morell-Gomis et al., 2011): This is a self-report instrument assessing five constructs (communication, social support, conflict, rules and consequences) about family dynamics. Items are rated on a 5-point Likert scale (1 = "never"; 5 = "always"). Although the original instrument measures these variables for each family member, for the purpose of this study, we asked about family conflict in general.

### Procedure

The study was approved by the Ethical Research Committee of Aragón (CEICA) and Research Ethics Committee (CEID) of Valencian International University (Spain) complied with the ethical standards established in the Spanish Data Protection and Guarantee of Digital Rights Law 3/2018. Parents were informed of the voluntary nature of the students' participation and the confidentiality of the data. The estimated duration was 30 to 40 min, being held in the regular classroom during school hours, under the researcher's supervision.

## Analytical Strategy

Descriptive statistics and Pearson's correlations were conducted. Multiple mediation analyses were performed using the PROCESS macro for SPSS (Hayes & Little, 2018). Two multiple mediation models were tested in which family conflict was the independent variable (*X*), impulsivity-related constructs were the potential mediators (*Ms*), and CC use (yes vs. no) and EC use (yes vs. no) in the last 30 days were the dependent variables (*Y*). Predictor and mediator variables were introduced into the model as continuous, based on the scores from the questionnaires described above. Gender and age were included as covariates in these analyses. Bias-corrected bootstrapping (with 20,000 resamples) was used to generate confidence intervals for the hypotheses tested as it is the preferred method for assessing indirect effects (Preacher & Hayes, 2008), which represent the effect of X on Y through M. Indirect effects estimate the difference in Y between two cases that differ by one unit on X through the joint effect of X on M, which, in turn, influences Y (Hayes & Rockwood, 2020). In this approach, effects are considered significant if the upper and lower bound of the bias-corrected 95% confidence intervals (95% CI) do not contain zero (Preacher & Kelley, 2011). The direct effects represent the relationship between *X* and *Y* not attributable to the mechanism through *M*. Results are presented as unstandardized coefficients for continuous variables and as log-odds for the dichotomous outcome variables.

Due to the use of cross-sectional data, reverse models were conducted for each outcome variable to evaluate the hypothesized models' specificity (Preacher & Hayes, 2008). More specifically, models were tested reversing each proposed mediator and predictor variable.

## Results

A third of the sample (33.0%) reported having smoked CC at some time during their lives, while a fifth (20.4%) reported having used EC. In terms of tobacco use in the previous 30 days, 14.0% of the sample reported having used CC, while 10.9% reported having used EC. Descriptive statistics and Pearson's correlations of the study variables are presented in Table 1. Family conflict was positively correlated with the two outcome variables (CC and EC use). In terms of correlations with the proposed mediating variables (impulsivity variables), family conflict positively correlated with positive urgency, negative urgency, and sensation seeking, and negatively correlated with perseverance and premeditation. All impulsivity variables correlated significantly with CC and EC use except for premeditation and EC use.

**Table 1** Descriptive statistics and bivariate correlations ($N = 879$)

| | Mean (*SD*) % (*n*) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.Age | 14.25 (1.88) | - | | | | | | | | |
| 2.Sex (male) | 56.4 (496) | −0.01 | - | | | | | | | |
| 3.Family conflict | 9.37 (3.14) | 0.18*** | −0.03 | - | | | | | | |
| 4.Negative urgency | 10.14 (2.95) | 0.06 | 0.02 | 0.23*** | - | | | | | |
| 5.Positive urgency | 10.25 (2.65) | 0.04 | 0.06 | 0.19*** | 0.53*** | - | | | | |
| 6.Sensation seeking | 10.85 (2.84) | 0.06 | 0.10** | 0.13*** | 0.30*** | 0.50*** | - | | | |
| 7.Premeditation | 12.18 (2.50) | −0.10** | 0.04 | −0.22*** | −0.10** | 0.03 | 0.04 | - | | |
| 8.Perseverance | 12.40 (2.66) | −0.18*** | −0.02 | −0.22*** | −0.08* | 0.06 | 0.11** | 0.63*** | - | |
| 9.CC use (last 30 days) | 14 (123) | 0.29*** | −0.01 | 0.13*** | 0.11** | 0.07* | 0.11** | −0.17*** | −0.14*** | - |
| 10.EC use (last 30 days) | 10.9 (96) | 0.10** | 0.07* | 0.10** | 0.10** | 0.11** | 0.15*** | −0.06 | −0.08* | 0.26*** |

*Note. CC*, conventional cigarette; *EC*, electronic cigarette. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

## Multiple Mediation Analyses

Both mediation models showed that the direct effect of family conflict (path c′) on CC and EC use was not significant. When examining the indirect effect of family conflict on CC use via impulsivity variables (Table 2), the total indirect effect was significant ($a*b = 0.063$, 95% CI [0.037, 0.095]). With respect to specific pathways, the indirect effect was significant through sensation seeking ($a*b = 0.013$, 95% CI [0.002, 0.028]) and through premeditation ($a*b = 0.029$, 95% CI [0.011, 0.050]). With regard to the indirect effect of family conflict on EC use via impulsivity variables (Table 3), the total indirect effect was also significant ($a*b = 0.059$, 95% CI [0.021, 0.091]). In terms of specific pathways, the only indirect effect that was significant was through sensation seeking ($a*b = 0.018$, 95% CI [0.006, 0.034]).

## Reverse Mediation Analysis

All of the results of the reverse models were non-significant. For CC use: negative urgency ($a*b = 0.005$, 95% CI [−0.005, 0.016]), positive urgency ($a*b = 0.004$, 95% CI [−0.005, 0.016]), sensation seeking ($a*b = 0.002$, 95% CI [−0.003, 0.007]), premeditation ($a*b = -0.005$, 95% CI [−0.019, 0.006]), and perseverance ($a*b = -0.004$, 95%

**Table 2** Multiple mediational analysis results controlled by covariates for CC use ($N = 879$)

| Direct | *b* | SE[a] | *p* | LLCI[b] | ULCI[c] |
|---|---|---|---|---|---|
| Family conflict → negative urgency ($a_1$) | **0.21** | **0.03** | **< 0.001** | **0.15** | **0.28** |
| Family conflict → positive urgency ($a_2$) | **0.16** | **0.03** | **< 0.001** | **0.11** | **0.22** |
| Family conflict → sensation seeking ($a_3$) | **0.11** | **0.03** | **< 0.001** | **0.05** | **0.17** |
| Family conflict → premeditation ($a_4$) | **−0.17** | **0.03** | **< 0.001** | **−0.22** | **−0.12** |
| Family conflict → perseverance ($a_5$) | **−0.16** | **0.03** | **< 0.001** | **−0.22** | **−0.11** |
| Negative urgency → CC use ($b_1$) | 0.08 | 0.04 | 0.086 | −0.01 | 0.16 |
| Positive urgency → CC use ($b_2$) | −0.01 | 0.05 | 0.802 | −0.12 | 0.09 |
| Sensation seeking → CC use ($b_3$) | **0.12** | **0.05** | **0.007** | **0.03** | **0.21** |
| Premeditation → CC use ($b_4$) | **−0.17** | **0.05** | **< 0.001** | **−0.28** | **0.07** |
| Perseverance → CC use ($b_5$) | −0.05 | 0.05 | 0.384 | −0.15 | 0.06 |
| Family conflict → CC use ($c'$) | 0.03 | 0.03 | 0.324 | −0.03 | 0.10 |
| **Indirect** | | *b* | SE[a] | BooLLCI[d] | BooULCI[e] |
| Total indirect effect | | **0.06** | **0.02** | **0.04** | **0.10** |
| Family conflict → negative urgency → CC use | | 0.02 | 0.01 | −0.00 | 0.04 |
| Family conflict → positive urgency → CC use | | −0.00 | 0.01 | −0.02 | 0.02 |
| Family conflict → sensation seeking → CC use | | **0.01** | **0.01** | **0.00** | **0.03** |
| Family conflict → premeditation → CC use | | **0.03** | **0.01** | **0.01** | **0.05** |
| Family conflict → perseverance → CC use | | 0.01 | 0.01 | −0.00 | 0.03 |

*Note. CC*, conventional cigarette; *EC*, electronic cigarette. The *b* estimates for pathways where CC (dichotomous) is the outcome variable reflects the increase or decrease in the predicted log odds of smoking that would be predicted by a 1 unit increase or decrease in family conflict while holding all other predictors constant

[a]Standard error; [b]lower limit confidence interval; [c]upper limit confidence interval; [d]bootstrap lower limit confidence interval; [e]bootstrap upper limit confidence interval

**Table 3** Multiple mediational analysis results controlled by covariates for EC use ($N = 879$)

| Direct | *b* | SE[a] | *p* | LLCI[b] | ULCI[c] |
|---|---|---|---|---|---|
| Family conflict → negative urgency ($a_1$) | **0.21** | **0.03** | **< 0.001** | **0.15** | **0.28** |
| Family conflict → positive urgency ($a_2$) | **0.16** | **0.03** | **< 0.001** | **0.11** | **0.22** |
| Family conflict → sensation seeking ($a_3$) | **0.11** | **0.03** | **< 0.001** | **0.05** | **0.17** |
| Family conflict → premeditation ($a_4$) | **− 0.17** | **0.03** | **< 0.001** | **− 0.22** | **− 0.12** |
| Family conflict → perseverance ($a_5$) | **− 0.16** | **0.03** | **< 0.001** | **− 0.22** | **− 0.11** |
| Negative urgency → EC use ($b_1$) | 0.05 | 0.05 | 0.322 | − 0.04 | 0.14 |
| Positive urgency → EC use ($b_2$) | 0.03 | 0.06 | 0.584 | − 0.08 | 0.14 |
| Sensation seeking → EC use ($b_3$) | **0.16** | **0.02** | **< 0.001** | **0.07** | **0.26** |
| Premeditation → EC use ($b_4$) | − 0.03 | 0.06 | 0.653 | − 0.13 | 0.08 |
| Perseverance → EC use ($b_5$) | − 0.10 | 0.05 | 0.079 | − 0.20 | 0.01 |
| Family conflict → EC use ($c'$) | 0.04 | 0.04 | 0.289 | − 0.03 | 0.10 |

| Indirect | *b* | SE[a] | BooLLCI[d] | BooULCI[e] |
|---|---|---|---|---|
| Total indirect effect | **0.05** | **0.02** | **0.02** | **0.09** |
| Family conflict → negative urgency → EC use | 0.01 | 0.01 | − 0.01 | 0.03 |
| Family conflict → positive urgency → EC use | 0.01 | 0.01 | − 0.01 | 0.02 |
| Family conflict → sensation seeking → EC use | **0.02** | **0.01** | **0.01** | **0.03** |
| Family conflict → premeditation → EC use | 0.00 | 0.01 | − 0.01 | 0.02 |
| Family conflict → perseverance → EC use | 0.02 | 0.01 | − 0.00 | 0.04 |

*Note. CC*, conventional cigarette; *EC*, electronic cigarette. The *b* estimates for pathways where EC (dichotomous) is the outcome variable reflects the increase or decrease in the predicted log odds of smoking that would be predicted by a 1 unit increase or decrease in family conflict while holding all other predictors constant

[a]Standard error; [b]lower limit confidence interval; [c]upper limit confidence interval; [d]bootstrap lower limit confidence interval; [e]bootstrap upper limit confidence interval

CI [− 0.017, 0.005]). For EC use: negative urgency ($a*b = 0.005$, 95% CI [− 0.006, 0.017]), positive urgency ($a*b = 0.005$, 95% CI [− 0.006, 0.017]), sensation seeking ($a*b = 0.002$, 95% CI [− 0.003, 0.009]), premeditation ($a*b = -0.006$, 95% CI [− 0.020, 0.007]), and perseverance ($a*b = -0.005$, 95% CI [− 0.019, 0.006]).

## Discussion

To our knowledge, this is the first study examining the role of impulsivity constructs in the relationship between family conflict and CC and EC use in adolescents. Our findings showed that family conflict was not directly related to CC and EC use, but that there was a significant positive indirect effect of family conflict through some specific impulsivity constructs. More specifically, sensation seeking was found as a significant positive mediator between family conflict and both tobacco use outcomes (CC and EC current use). These findings are in line with previous studies, such as Trujillo et al. (2016), who found that sensation seeking mediated between family conflict and current alcohol and

marijuana use. Family conflict has an impact on how adolescents cope with distress and unpleasant emotions, with drug use as an emotional regulation strategy (Trujillo et al., 2016). In this regard, sensation seeking—one of the most widely studied impulsivity variables in relation to substance use—has consistently been found to be positively associated with tobacco use (Doran & Tully, 2018; Kelly et al., 2019; Peterson & Smith, 2017). However, our findings differ from studies such as Case et al. (2017), who found a relationship between sensation seeking and starting to use EC but not with current EC use. This discrepancy may be for a number of reasons, such as the use of different questionnaires, the studies having been done in different countries in which patterns of EC use may be different (USA vs. Spain), or because the current study examined sensation seeking as a mediator variable. More research is needed to clarify how sensation seeking is associated with the use of different tobacco products.

Our results also showed that family conflict had a significant positive indirect effect on CC use through lower premeditation. This finding is in line with previous studies which found that a lack of premeditation was strongly associated with smoking in young people (Ozga-Hess et al., 2020) and in the general population (Kale et al., 2018). In fact, a lack of premeditation, understood as not thinking about potential consequences before acting, has also been found to be associated with early and later substance use (Lynam & Miller, 2004).

The findings of the current study highlight how important adolescents' social contexts and family interactions are when it comes to tobacco use (Al-Halabí Díaz et al., 2009; Luk et al., 2018; Thomas et al., 2016). The main finding of this study suggests that adolescents who live in families where conflicts are frequent are more likely to use CC and EC through higher sensation seeking and lower premeditation.

Our results also show that impulsivity-related variables have differing impacts on tobacco use. More specifically, our data shows that only sensation seeking and premeditation act as mediation variables between family conflict and current CC and CE use. This is in contrast to the meta-analysis by Bos et al. (2019), in which all of the UPPS-P model traits were associated with CC use. However, those differences may be due to the definition of tobacco use. It should be noted that a recent study has shown a reverse mediation relationship between the variables examined in our study. Wang et al. (2021) found that family conflict has a mediating role between impulsivity and CC use. They explained that adolescents' impulsive behavior can produce stress in the family due to conflict and it can lead to drug use. In our study, reverse mediation analysis yielded non-significant results. However, bidirectionality may exist and should be examined in longitudinal studies. Regardless of what produces the conflict in the family, it is important to study how this variable impacts substance use. As mentioned above, our results did not show a direct effect of family conflict on tobacco use, but rather an indirect effect through sensation seeking and premeditation. As Wang et al. (2021) pointed out, adolescents who experience family conflict may use substances as a way of escaping from that situation. Therefore, considering the literature and the results of our study, the tendency to behave impulsively could be considered a learned coping mechanism for some adolescents for dealing with the discomfort produced by family conflict.

These findings have several clinical implications in terms of prevention and treatment of tobacco use in adolescents. Firstly, when designing prevention and intervention strategies, the differential role of specific impulsivity constructs (Strickland & Johnson, 2020) should be considered, along with training in alternative, healthier coping strategies. Therefore, the inclusion of family and impulsivity-related components in school-based substance use prevention programs (Velasco et al., 2017; Vigna-Taglianti et al., 2014; Villanueva et al.,

2021) may improve their effectiveness on tobacco use and even indirectly on cannabis use due to this substance is usually consumed with tobacco (EMCDDA, 2019). Secondly, the previous literature shows that parents who attend prevention programs tend to have a low risk profile, with low participation of high-risk families (Al-Halabí Díaz & Errasti Pérez, 2009; Errasti Pérez et al., 2008). More effort is needed in active recruitment and intervention with families through selective and indicated prevention (Van Ryzin et al., 2016).

In addition, any reductions in the aforementioned risk factors need to be accompanied by legislative measures to prevent minors from accessing tobacco products. Nicotine affects neurocognitive development (Smith et al., 2015), and once somebody starts using conventional tobacco products, the probability of them using e-cigarettes increases, and vice versa (Hittner et al., 2020).

The current study has some limitations. First, due to the cross-sectional nature of our data, casual and temporal interpretations could not be established. Future research should examine longitudinal associations between family conflict, impulsivity traits, and CC and EC use. Second, the study sample is exclusively from Spain, so the results cannot be generalized to adolescents from other cultural backgrounds. In addition, it would be interesting to examine other variables that might also be associated with CC and EC use. For instance, it would be necessary to study whether sex differences regarding the impact of family and personality variables on CC and EC use exist. Moreover, social and economic variables should be examined or included as covariates in future studies since they constitute an important predictor of smoking among adolescents (Polanska et al., 2022). For instance, family income or socioeconomic status could be related to school choice, which could be impacting our findings. Finally, the study measures were self-report instruments, and although the effectiveness of this assessment method has been demonstrated, it may be affected by response bias and social desirability (Krumpal, 2013).

## Conclusions

This study extends previous literature by showing that family conflict is associated with current CC and EC use through specific impulsive traits. More specifically, our findings indicate that, in adolescence, family conflict is associated with current CC and EC use through sensation seeking, and in the case of current CC use, premeditation also has an important role as a mediator variable.

**Funding** Study funded by Valencian International University (PII2021_02).

## Declarations

**Conflict of Interest** The authors declare no competing interests.

## References


Al-Halabí Díaz, S., Errasti Pérez, J. M., Fernández Hermida, J. R., Carballo Crespo, J. L., Secades Villa, R., & García Rodríguez, O. (2009). El colegio y los factores de riesgo familiar en la asistencia a programas de prevención familiar del consumo de drogas. *Adicciones, 21*, 39–48. https://doi.org/10.20882/adicciones.250

Al-Halabí Díaz, S., & Errasti Pérez, J. M. (2009). Use of small incentives for increasing participation and reducing dropout in a family drug-use prevention program in a Spanish sample. *Substance Use & Misuse, 44*(14), 1990–2000. https://doi.org/10.3109/10826080902844870

Best, D. W., Wilson, A. S., MacLean, S., Savic, M., Reed, M., Bruun, A., & Lubman, D. I. (2014). Patterns of family conflict and their impact on substance use and psychosocial outcomes in a sample of young people in treatment. *Vulnerable Children and Youth Studies, 9*(2), 114–122. https://doi.org/10.1080/17450128.2013.855858

Boletín Oficial del Estado. (2020). Ley Orgánica 3/2020, de 29 de diciembre, por la que se modifica la Ley Orgánica 2/2006, de 3 de mayo, de Educación. https://www.boe.es/boe/dias/2020/12/30/pdfs/BOE-A-2020-17264.pdf

Bos, J., Hayden, M. J., Lum, J. A. G., & Staiger, P. (2019). UPPS-P impulsive personality traits and adolescent cigarette smoking: A meta-analysis. *Drug and Alcohol Dependence, 197*, 335–343. https://doi.org/10.1016/j.drugalcdep.2019.01.018

Cándido, A., Orduña, E., Perales, J. C., Verdejo-García, A., & Billieux, J. (2012). Validation of a short Spanish version of the UPPS-P impulsive behaviour scale. *Trastornos Adictivos, 14*(3), 73–78. https://doi.org/10.1016/S1575-0973(12)70048-X

Case, K. R., Harrell, M. B., Pérez, A., Loukas, A., Wilkinson, A. V., Springer, A. E., Creanerm, N. R., & Perry, C. L. (2017). The relationships between sensation seeking and a spectrum of e-cigarette use behaviors: Cross-sectional and longitudinal analyses specific to Texas adolescents. *Addictive Behaviors, 73*, 151–157. https://doi.org/10.1016/j.addbeh.2017.05.007

Casey, B., & Jones, R. M. (2010). Neurobiology of the adolescent brain and behavior: Implications for substance use disorders. *Journal of the American Academy of Child and Adolescent Psychiatry, 49*(12), 1189–1201. https://doi.org/10.1016/j.jaac.2010.08.017

Caswell, A. J., Bond, R., Duka, T., & Morgan, M. J. (2015). Further evidence of the heterogeneous nature of impulsivity. *Personality and Individual Differences, 76*, 68–74. https://doi.org/10.1016/j.jaac.2010.08.017

Cornellà-Font, G. M., Viñas-Poch, F., Juárez-López, J. R., & Malo-Cerrato, S. (2020). Risk of addiction: Its prevalence in adolescence and its relationship with security of attachment and self-concept. *Clínica y Salud, 31*(1), 21–25. https://doi.org/10.5093/clysa2020a1

Cyders, M. A., Smith, G. T., Spillane, N. S., Fischer, S., Annus, A. N., & Peterson, C. (2007). Integration of impulsivity and positive mood to predict risky behavior: Development and validation of a measure of positive urgency. *Psychological Assessment, 19*(1), 107–118. https://doi.org/10.1037/1040-3590.19.1.107

Cyders, M. A., Coskunpinar, A., & VanderVeen, J. D. (2016). Urgency: A common transdiagnostic endophenotype for maladaptive risk taking. In V. Zeigler-Hill & D. K. Marcus (Eds.), *The dark side of personality: Science and practice in social, personality, and clinical psychology* (pp. 157–188). American Psychological Association. https://doi.org/10.1037/14854-009

Doran, N., & Tully, L. (2018). Impulsivity and tobacco product use over time. *Addictive Behaviors, 85*, 153–157. https://doi.org/10.1016/j.addbeh.2018.06.007

EPDATA. (2021). *Buscador de colegios públicos y privados, datos y estadísticas* . Europa Press. Retrieved from https://www.epdata.es/datos/buscador-colegios-publicos-privados-datos-estadisticas/440#:~:text=El%20mapa%20muestra%20la%20proporci%C3%B3n,frente%20a%20la%20privada%20cambia

Errasti Perez, J. M., Al-Halabí Diaz, S. A., Fernandez Hermida, J. R., Secades Villa, R., Carballo Crespo, J. L., & García Rodriguez, O. (2008). Recruitment characteristics influencing parental participation in family-based drug-abuse prevention programs: The Spoth and Redmond model in Spain. *Substance Use & Misuse, 43*(7), 850–857. https://doi.org/10.1080/10826080701801188

Eurobarometer (2021). Attitudes of Europeans towards tobacco and electronic cigarettes. *European Commission.*

European Monitoring Centre for Drugs and Drug Addiction [EMCDDA]. (2019*). European drug report 2019: Trends and developments*. Publications Office of the European Union, Luxembourg. Retrieved at http://www.emcdda.europa.eu/system/files/publications/11364/20191724_TDAT19001ENN_PDF.pdf

Fernández-Artamendi, S., Martínez-Loredo, V., & López-Núñez, C. (2021). Sex differences in comorbidity between substance use and mental health in adolescents: Two sides of the same coin. *Psicothema, 33*(1), 36–43. https://doi.org/10.7334/psicothema2020.297

Hayes, A. F., & Little, T. D. (2018). *Introduction to mediation, moderation, and conditional process analysis : A regression-based approach* (2nd ed.). Guilford Press.

Hayes, A. F., & Rockwood, N. J. (2020). Conditional process analysis: Concepts, computation, and advances in the modeling of the contingencies of mechanisms. *American Behavioral Scientist, 64*(1), 19–54. https://doi.org/10.1177/0002764219859633

Henneberger, A. K., Mushonga, D. R., & Preston, A. M. (2021). Peer influence and adolescent substance use: A systematic review of dynamic social network research. *Adolescent Research Review, 6*, 57–73. https://doi.org/10.1007/s40894-019-00130-0

Hittner, J., Penmetsa, N., Bianculli, V., & Swickert, R. (2020). Personality and substance use correlates of e-cigarette use in college students. *Personality and Individual Differences, 152*, 109605. https://doi.org/10.1016/j.paid.2019.109605

Hoffmann, J. P. (2021). Sensation seeking and adolescent e-cigarette use. *Journal of Substance Use, 26*(5), 542–548. https://doi.org/10.1080/14659891.2020.1856209

Hrywna, M., BoverManderski, M. T., & Delnevo, C. D. (2020). Prevalence of electronic cigarette use among adolescents in New Jersey and association with social factors. *JAMA Network Open, 3*(2), e1920961. https://doi.org/10.1001/jamanetworkopen.2019.20961

Hsu, Y. T., & Kawachi, I. (2019). Timing of family adversity during adolescence and its impact on alcohol and tobacco initiation: A longitudinal study among Taiwanese adolescents. *Child Psychiatry & Human Development, 50*, 257–267. https://doi.org/10.1001/jamanetworkopen.2019.20961

International Society for Research on Impulsivity. (2019). What is impulsivity. Retrieved from http://www.impulsivity.org/index.htm

Kale, D., Pickering, A., & Cooper, A. (2020). Examining the relationship between impulsivity-related personality traits and e-cigarette use in adults. *Addictive Behaviors, 106*, 106348. https://doi.org/10.1016/j.addbeh.2020.106348

Kale, D., Stautz, K., & Cooper, A. (2018). Impulsivity related personality traits and cigarette smoking in adults: A meta-analysis using the UPPS-P model of impulsivity and reward sensitivity. *Drug and Alcohol Dependence, 185*, 149–167. https://doi.org/10.1016/j.drugalcdep.2018.01.003

Kelly, E. V., Grummitt, L., Teesson, M., & Newton, N. C. (2019). Associations between personality and uptake of tobacco smoking: Do they differ across adolescence? *Drug and Alcohol Review, 38*, 818–822. https://doi.org/10.1111/dar.12975

Krumpal, I. (2013). Determinants of social desirability bias in sensitive surveys: A literature review. *Quality & Quantity, 47*(4), 2025–2047. https://doi.org/10.1007/s11135-011-9640-9

Loke, A. Y., & Mak, Y. (2013). Family process and peer influences on substance use by adolescents. *International Journal of Environmental Research and Public Health, 10*, 3868–3885. https://doi.org/10.3390/ijerph10093868

Luk, T. T., Wan, M. O., Leun, L. T., Chen, J., Wu, Y., & Lam, T. H. (2018). Perceived family relationship quality and use of poly-tobacco products during early and late adolescence. *Addictive Behaviors, 85*, 38–42. https://doi.org/10.1016/j.addbeh.2018.05.011

Lynam, D. T., & Miller, J. D. (2004). Personality pathways to impulsive behavior and their relations to deviance: Results from three samples. *Journal of Quantitative Crimonology, 20*(4), 319–341. https://doi.org/10.1007/s10940-004-5867-0

Lynam, D. R., Whiteside, S. P., Smith, G. T., & Cyders, M. A. (2006). *The UPPS-P: Assessing five personality pathways to impulsive behavior*. Purdue University.

Mlouki, I., Bouanene, I., Sioud, I., Bchir, A., Al' Absi, M., & El Mhamdi, S. (2021). Impulsivity mediates the impact of early life adversity on high risk behaviors among Tunisian adolescents. *Preventive Medicine Reports, 23*, 101424. https://doi.org/10.1016/j.pmedr.2021.101424

Morell-Gomis, R., García, J. A., Gázquez, M., & García, Á. (2011). Cuestionario para la evaluación de variables familiares relacionadas con el consumo de drogas en estudiantes universitarios. *Salud y Drogas, 11*(2), 143–162.

Observatorio Español de las Drogas y de las Adicciones (2014). *Encuesta estatal sobre uso de Drogas en enseñanzas secundarias (ESTUDES) 2012*. Madrid: Ministerio de Sanidad, Servicios Sociales e Igualdad

Observatorio Español de las Drogas y de las Adicciones (2019). *Encuesta estatal sobre uso de Drogas en enseñanzas secundarias (ESTUDES) 2018-2019*. Madrid: Ministerio de Sanidad, Servicios Sociales e Igualdad

Ozga-Hess, J. E., Romm, K. F., Felicione, N. J., Dino, G., Blank, M. D., & Turiano, N. A. (2020). Personality and impulsivity as predictors of tobacco use among emerging adults: A latent class analysis. *Personality and Individual Differences, 163*, 110076. https://doi.org/10.1016/j.paid.2020.110076

Peterson, S. J., & Smith, T. (2017). Association between elementary school personality and high school smoking and drinking. *Addiction, 112*(11), 2043–2052. https://doi.org/10.1111/add.13905

Polanska, K., Znyk, M. & Kaleta, D. (2022). Susceptibility to tobacco use and associated factors Among youth in five central and eastern European countries. *BMC Public Health*, 22 (72). https://doi.org/10.1186/s12889-022-12493-6

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*, 879–891. https://doi.org/10.3758/BRM.40.3.879

Preacher, K. J., & Kelley, K. (2011). Effect size measures for mediation models: Quantitative strategies for communicating indirect effects. *Psychological Methods, 16*(2), 93–115. https://doi.org/10.1037/a0022658

Rajesh, V., Diamond, P., Spitz, M. & Wilkinson, A. (2015). Smoking initiation among Mexican heritage youth and the roles of family cohesion and conflict. *Journal of Adolescent Health,* 1-7https://doi.org/10.1016/j.jadohealth.2015.01.021

Smith, R. R., McDonald, C. G., Bergstrom, H., Ehlinger, D. G., & Birelmaier, J. M. (2015). *Neuroscience and Biobehavioral Reviews, 55*, 432–443. https://doi.org/10.1016/j.neubiorev.2015.05.019

Strickland, J. C., & Johnson, M. W. (2020). Rejecting impulsivity as a psychological construct: A theoretical empirical and sociocultural argument. *Psychological Review. Advance online publication, 5*, 425.

Thomas, R. E., Baker, P., & Thomas, B. C. (2016). Family-based interventions in preventing children and adolescents from using tobacco: A systematic review and meta-analysis. *Academic Pediatrics, 16*(5), 419–429. https://doi.org/10.1016/j.acap.2015.12.006

Tobore, T. I. (2019). On the potential harmful effects of E-Cigarettes (EC) on the developing brain: The relationship between vaping-induced oxidative stress and adolescent/young adults social maladjustment. *Journal of Adolescence, 76*, 202–209. https://doi.org/10.1016/j.adolescence.2019.09.004

Trujillo, A., Obando, D., & Trujillo, C. A. (2016). Family dynamics and alcohol and marijuana use among adolescents: The mediating role of negative emotional symptoms and sensation seeking. *Addictive Behaviors, 62*, 99–107. https://doi.org/10.1016/j.addbeh.2016.06.020

U.S. Department of Health and Human Services. (2016). *E-cigarette use among youth and young adults. A report of the surgeon general*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

Van Ryzin, M. J., Roseth, C. J., Fosco, G. M., Lee, Y., & Chen, I. C. (2016). A component-centered meta-analysis of family-based prevention programs for adolescent substance use. *Clinical Psychology Review, 45*, 72–80. https://doi.org/10.1016/j.cpr.2016.03.007

Velasco, V., Griffin, K. W., Botvin, G. J., Celata, C., & Lombardia, G. L. S. T. (2017). Preventing adolescent substance use through an evidence-based program: Effects of the Italian adaptation of life skills training. *Prevention Science, 18*(4), 394–405. https://doi.org/10.1007/s11121-017-0776-2

Vigna-Taglianti, F. D., Galanti, M. R., Burkhart, G., Caria, M. P., Vadrucci, S., Faggiano, F., EU-Dap Study Group. (2014). "Unplugged", a European school-based program for substance use prevention among adolescents: Overview of results from the EU-Dap trial. *New Directions for Youth Development, 141*, 67–82. https://doi.org/10.1002/yd.20087

Villanueva, V. J., Puig-Perez, S., & Becoña, E. (2021). Efficacy of the "Sé tú Mismo"(be yourself) program in prevention of cannabis use in adolescents. *International Journal of Mental Health and Addiction, 19*(4), 1214–1226. https://doi.org/10.1007/s11469-019-00219-6

Wang, Y., Long, J., Liu, Y., Liu, T., & Billieux, J. (2020). Psychometric properties of the Chinese SUPPS-P Impulsive Behavior Scale: Factor structure and measurement invariance across gender and age. *Frontiers in Psychiatry, 11*, 1296. https://doi.org/10.3389/fpsyt.2020.529949

Wang, Z., Buu, A., Lohrmann, D. K., Shih, P. C., & Lin, H. (2021). The role of family conflict in mediating impulsivity to early substance exposure among preteens. *Addictive Behaviors, 115*, 106779. https://doi.org/10.1016/j.addbeh.2020.106779

Whiteside, S. P., & Lynam, D. R. (2001). The Five Factor Model and impulsivity: Using a structural model of personality to understand impulsivity. *Personality and Individual Differences, 30*, 669–689.

Wills, T. A., Resko, J. A., Ainette, M. G., & Mendoza, D. (2004). Role of parent support and peer support in adolescent substance use: A test of mediated effects. *Psychology of Addictive Behaviors, 18*(2), 122–134. https://doi.org/10.1037/0893-164X.18.2.122

World Health Organization. (2020). Tobacco. *World Health Organization.* Retrieved from https://www.who.int/news-room/fact-