

# The relationship between suicidal behavior and perceived stress: The role of cognitive emotional regulation and problematic alcohol use in Spanish adolescents

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## Abstract

Suicidal behavior has become an important public health problem, correlating with stress and emotional deficits in recent research. This study examined the relationship between perceived stress and suicidal behavior risk, testing the mediating roles of cognitive emotion regulation and impulsivity, and the moderating role of problematic alcohol use in stress-suicidal behavior association in a sample of 121 Spanish adolescents surveyed online. Results showed positive and significant associations between perceived stress and suicidal behavior risk, as well as a mediation role of adaptive cognitive emotion regulation strategies and a moderation role of problematic alcohol use between perceived stress and suicidal behavior risk, supporting stress as an influential factor in suicidal behavior. Our findings emphasize adaptive emotional regulation strategies in stressful situations, as well as the importance of promoting responsible alcohol consumption to decrease suicide risk in adolescents. Additionally, they contribute to effective educational suicide prevention programs for young people.

## Keywords

adolescent, cognitive emotion regulation, impulsivity, perceived stress, problematic alcohol use, suicidal behavior

## Introduction

In recent years, suicide has become a leading cause of death in young people worldwide (Renaud et al., 2022). In 2021, Spain recorded 4003 deaths by suicide, and it was the first leading cause of non-natural death among people aged 15–19 years (Spanish Foundation for Suicide Prevention [FSME], 2022). However, death by suicide is an extreme manifestation of the suicidal behavior continuum. Concretely, there are more prevalent suicidal behavior

manifestations among youth, such as suicidal ideation or suicide attempt (Mosquera, 2016). Suicidal behavior is an extremely complex and

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multifactorial problem, and several individual and social factors are involved in its appearance and maintenance (Gómez-Romero et al., 2018, 2020).

During the last decade, there has been a surge of interest in how *stress* could be influencing suicidal behavior and it has been established as an important risk factor in several theories about suicide (Stewart et al., 2019). Although previous research has indicated that higher levels of perceived stress correlate with increased risk of suicidal behavior in young people (e.g. Chen and Kuo, 2020), some researchers have proposed the existence of other elements that could explain this association. Thus, it is necessary to identify factors that could be influencing the perceived stress-suicidal behavior association during adolescence.

### ***Problematic alcohol use and its relationship with Suicidal Behavior***

Problematic substance use has become a prevalent risk behavior during adolescence. Between 2018 and 2019, the most consumed drugs in Spain by people aged 14–18 years were the legal drugs alcohol and tobacco, followed by cannabis (Spanish Observatory of Drugs and Addictions [OEDA], 2021). Although the legal age of consumption is from 18 years in Spain, the average age of initiation of consumption was between 14 and 16 years and the prevalence of consumption increased with age. Problematic alcohol use during adolescence has been linked to an increased risk of suicidal behavior (Schilling et al., 2009; Sellers et al., 2019; Wang and Yen, 2017; ), but the direction of this relationship remains unclear. For example, some researchers suggest that high alcohol use could increase the relationship between depressive symptoms and suicidal behavior (Rubio et al., 2020), which demonstrates the importance of considering possible interaction factors. Additionally, existing research has recognized that stress could play an important role in problematic substance use in adolescents and data

from some studies has indicated that this risky behavior could be used as a coping strategy under stressful situations (Grigsby et al., 2016; Romano et al., 2021).

### ***The role of impulsivity***

Though empirical research has demonstrated a significant association between impulsivity and suicidal behavior (Gvion et al., 2015; Hadzic et al., 2020), other studies have reported inconsistent findings. For example, Auerbach et al. (2017) suggested that different facets of impulsivity might be related to different components of suicidal behavior, whereas in their meta-analysis, Anestis et al. (2014) concluded a significant but very small association. They argued the existence of methodological and theoretical limitations like inconsistent operationalizations of impulsive attempts and divergences when evaluating them (for instance, differences in the items applied). Therefore, literature on adolescence requires more exploration about how impulsivity could be influencing suicidal behavior.

### ***The protective role of cognitive emotional regulation***

Not all adolescents who are exposed to adverse situations end up developing health-related problems. Emotion regulation has been considered a key protective factor for well-being and an essential ingredient for achieving optimal psychological functioning (Limonero et al., 2012).

Emotion Regulation can refer to “the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions” (Gross, 1998: 275). Considering the complexity and range of processes that involve emotion regulation, the study focused on cognitive emotional regulation. Garnefski et al. (2001) defined it as the cognitive pathway that handles the input of emotionally

exciting information and reflects the cognitive part of coping (Garnefski and Kraaij, 2016). They proposed nine strategies that people tend to use to regulate emotions under stressful situations classified into two more general categories: adaptive (*acceptance, positive reappraisal, refocusing on planning, positive refocusing, and putting into perspective*) and maladaptive strategies (*rumination, catastrophizing, self-blame, and blaming others*).

In the adolescent population, maladaptive strategies have been related to mental health problems and risky behaviors, whereas adaptive strategies have been associated to better indicators of health and well-being (Extremera et al., 2019; Singh and Singh, 2023). Although recent evidence has identified associations between cognitive emotion regulation strategies and suicidal behavior such as suicidal ideation (Quintana-Orts et al., 2020), further understanding is needed in this area.

Based on this theoretical background, the aim of this paper was to analyze the possible effects of perceived stress on suicidal behavior risk in a sample of Spanish adolescents (Girona, Spain). In addition, we tested the mediating roles of impulsivity and cognitive emotion regulation strategies, as well as the moderating role of problematic alcohol use between perceived stress and suicidal behavior risk. Specifically, several hypotheses are proposed according to previous findings:

**Hypothesis 1.** Higher levels of perceived stress are associated with a higher risk of suicidal behavior.

**Hypothesis 2.** The relationship between perceived stress and suicidal behavior risk is moderated by a problematic alcohol use. That is, the effects of perceived stress on suicidal behavior risk are stronger in those adolescents who have a problematic consumption.

**Hypothesis 3.** The relationship between perceived stress and suicidal behavior risk is mediated by impulsivity. That is, adolescents with higher perceived stress, tend to present higher impulsivity, which turns into higher suicidal behavior risk.

**Hypothesis 4.** The relationship between perceived stress and suicidal behavior risk is mediated by cognitive emotion regulation strategies. That is, adolescents with higher perceived stress tend to use less adaptive strategies and more maladaptive strategies, which is translated in higher suicidal behavior risk.

## Method

### Design and participants

A cross-sectional design was proposed, where data were collected at a specific point in time through convenience sampling between January and March 2022. One hundred twenty-one students were recruited from various high schools from the province of Girona (Catalonia, Spain) of which 62% were girls ( $N=75$ ). The age range was from 16 to 19 years ( $M=16.97$ ,  $SD=0.67$ ). Regarding academic level, 89.2% were in high school ( $N=108$ ) and 10.8% were in professional training ( $N=13$ ). Of those who were in high school, 33.9% were in the 12th year ( $N=41$ ) and 55.4% in the 13th ( $N=67$ ). On the other hand, most of participants studied in a public high school (85.1%). There was initially a total of 123 responses, but two cases were removed from the sample because an anomalous response pattern was identified. Finally, all participants gave their prior consent to participate.

### Measures

The participants answered an anonymous and self-administered online questionnaire (Google Forms) that included sociodemographic data and the following questionnaires.

**Perceived stress.** Perceived stress was evaluated using the Spanish validation of the abbreviated version of the “Perceived Stress Scale” (PSS-10; Cohen et al., 1983; Remor, 2006). The PSS-10 assesses levels of perceived stress over the preceding month and is composed of 10 Likert-type items (e.g. “in the last month, how often have you found that you could not cope with all the things that you had to do?”) scored from 0 (“never”) to 4 (“very often”). Total scores can range from 0 to 40 and higher scores indicate higher levels of perceived stress. Items 6, 7, 8, and 9 are reversed. The Cronbach’s  $\alpha$  obtained in this study was .86.

**Suicidal behavior.** Suicidal behavior was assessed using the Spanish validation of “Suicidal Behaviors Questionnaire-Revised” (SBQ-R; Gómez-Romero et al., 2021; Osman et al., 2001). An example of item includes “*Have you ever thought about killing yourself in the past year?*” The SBQ-R is composed of four items designed to identify lifetime suicidal ideation and attempts, suicidal ideation and attempts in the last 12 months, communication of suicidal intent, and likelihood of a future suicide attempt in adolescents and young adults (Gómez-Romero et al., 2021; Hirsch et al., 2019). Total score is obtained through the sum of the items, and it can range from 3 to 18. Finally, punctuations  $\geq 7$  would indicate suicidal behavior risk. The Cronbach’s  $\alpha$  obtained in this study was .87.

**Problematic alcohol use.** To assess problematic alcohol consumption, several questions were adapted from the “Survey on Drug Use in Secondary Education in Spain” ([ESTUDES, 2021] Spanish Observatory of Drugs and Addictions, 2021b). The section included seven questions related to the frequency of consumption and inebriation in the last week and in the last month. This survey is answered based on the frequency of consumption. That is, the participants marked how many days they consumed in the last month in different ranges of days (0 day, 1 day, and every weekend). An example item includes: “*In the last month, how often have you consumed alcohol?*”

**Impulsivity.** Impulsivity was assessed through the Spanish validation of the “Plutchik Impulsivity Scale” (Alcázar-Córcoles et al., 2015; Plutchik and Van Praag, 1989). This questionnaire comprises 15 items and uses a 4-point Likert scale (from 0, “never”, to 3, “almost always) to evaluate the person’s tendency to do things without thinking or to act impulsively (e.g. “*Do you have problems controlling your feelings?*”). Total score is obtained through the sum of the items, and it can range from 0 to 45. Items 4, 5, 11, and 15 are reversed. The Cronbach’s  $\alpha$  obtained in this study was .70.

**Cognitive emotional regulation strategies.** Cognitive emotion regulation strategies were assessed using the Spanish validation of the shortened version of the “Cognitive Emotion Regulation Questionnaire” (CERQ-18; Chamizo-Nieto et al., 2020; Garnefski et al., 2001). The CERQ-18 is composed of 18 Likert-type items that can range from 1 (“almost never”) to 5 (“always”) and evaluates the cognitive processes that people tend to use when experiencing negative events into two factors: adaptive strategies and maladaptive strategies. Adaptive strategies included: acceptance (e.g. “*I think that I have to accept that this has happened*”), positive reappraisal (e.g. “*I think I can learn something from the situation*”), refocusing on planning (e.g. “*I think about a plan of what I can do best*”), positive refocusing (e.g. “*I think of pleasant things that have nothing to do with it*”), and putting into perspective (e.g. “*I think that it hasn’t been too bad compared to other things*”). On the other hand, maladaptive strategies included: rumination (e.g. “*I often think about how I feel about what I have experienced*”), catastrophizing (e.g. “*I keep thinking about how terrible it is what I have experienced*”), self-blame (e.g. “*I feel that I am the one who is responsible for what has happened*”), and blaming others (e.g. “*I feel that others are responsible for what has happened*”). Higher scores in each of the subscales would indicate a greater frequency in the use of those strategies. The Cronbach’s  $\alpha$  obtained in the adaptive strategies subscale was 0.84, and that obtained in the maladaptive subscale was 0.76.

## Procedure

The sample was collected through a convenience sampling and the questionnaire was administered online (Google Forms). An information sheet was prepared and sent to high school management teams (director and his/her team) by email to invite them to collaborate voluntarily. This document contained information related to the study aims, anonymity, confidentiality, voluntary participation, and ethics. In addition, due to the topic evaluated, we communicated that there was a voluntary option for participants to contact with them in case of health risk detection. High schools that agreed to participate proceeded to the dissemination of the online questionnaire to their students. Prior to its dissemination, a small pilot study was performed with six high school students to provide feedback about the survey. All the information regarding voluntary participation, confidentiality, and anonymity was provided at the beginning of the questionnaire, and participants had to give their prior consent to participate in the study. Finally, a voluntary contact option was provided in case of health risk detection. Participants did not receive any compensation for their participation.

## Statistical analysis

Data management and analysis were performed using SPSS V 26 (IBM Corporation, Armonk NY, USA). Descriptive analyses were generated for all variables, where continuous variables were expressed in mean and standard deviation and categorical variables in percentages. Normality was tested using the Kolmogorov-Smirnov criterion, and reliability was calculated using Cronbach's alpha for all the questionnaires.

To obtain the values for the prevalence of suicidal behavior risk and problematic alcohol use, the variables were recoded into binary categories (Suicidal risk vs non suicidal risk and problematic consumption vs non-problematic consumption). Chi-squared tests were used to identify possible gender associations with consumption, as well as between consumption and suicidal behavior risk. On the other hand,

Student's *t* (normal distribution) or Mann-Whitney's *U* (non-normal distribution) were made to compare gender differences with perceived stress, suicidal behavior, impulsivity, and cognitive emotion regulation strategies. Additionally, Cohen's *d* was calculated to identify the magnitude of the effect in those statistically significant results (Cohen, 1988). Pearson correlations were also conducted to assess possible associations between continuous variables. Finally, mediation and moderation analysis were carried out through the PROCESS macro of SPSS version 4.0 (Hayes, 2022). In mediation, suicidal behavior was entered as the outcome, perceived stress as the predictor variable and adaptive and maladaptive cognitive emotion regulation strategies and impulsivity as mediators. For moderation, suicidal behavior was entered as the outcome, perceived stress as the predictor variable and problematic alcohol use as a moderator. In both mediation and moderation analyses, suicidal behavior was introduced as continuous variable. Finally, to categorize alcohol use for the analyses, we considered the variable of consumption referred to inebriation. Thus, problematic alcohol use was categorized into "high alcohol use" (if they got drunk two or more days in the last month) and "low alcohol use" (if they did not consume or got drunk 1 day in the last month).

## Ethical considerations

The present study has been approved by the Commission of Ethics in Animal and Human Experimentation of the Autonomous University of Barcelona (ref. number CEEAH 3850). To ensure ethical considerations, we incorporated a voluntary contact option at the conclusion of the questionnaire. Participants were given the opportunity to indicate if any aspects related to their health were detected and if they desired to be notified. If affirmative, participants were requested to provide their email address. For those exhibiting scores suggestive of suicidal risk, an informative email was sent to them to inform and encourage discussions with their parents, family doctor, or mental health referent within their locality. The

risk assessment was based on the scores obtained from the widely recognized SBQ-R questionnaire. Importantly, the information shared by the participants was solely utilized for the purpose of contact and held in strict confidence.

## Results

### Prevalence of suicidal behavior risk

Among the total sample, 34.7% of the adolescents ( $n=42$ ) were at risk for suicidal behavior (following the criterion established in SBQ-R scale: total score  $\geq 7$ ). Concerning specific items of the questionnaire, 25.6% had experienced suicidal ideation at some point in their life, 16.5% had at least one plan to commit suicide, and 8.3% had attempted it. Moreover, 15.7% presented suicidal ideation in the last 12 months (often or very often) and 9.9% had communicated to other people more than one time that they had considered suicide. Finally, the probability of suicidal behavior in the future was reported by one participant.

### Alcohol use: Prevalence and associations with suicidal behavior

Regarding alcohol consumption, 70.2% of the adolescents had consumed alcohol at some point in their life. In addition, 55.4% ( $n=67$ ) had consumed alcohol in the last month, and 36.4% ( $n=44$ ) of those adolescents had problematic alcohol use (they got drunk). Girls consumed more alcohol in the previous month ( $\chi^2=5.61$ ;  $df(1)$ ,  $p=0.018$ ), but boys started getting drunk earlier ( $t=-2.06$ ;  $df=69$ ;  $p=0.043$ ;  $d=0.529$ ). Also, drunkenness in the last month was associated with drinking in the street ( $\chi^2=45.61$ ;  $df(1)$ ,  $p<0.001$ ). No significant results were identified between problematic alcohol use and suicidal behavior risk.

### Perceived stress, suicidal behavior risk, cognitive emotion regulation strategies, and impulsivity: Differences according to gender

Girls presented higher levels of perceived stress ( $t=-5.25$ ;  $df=118$ ;  $p<0.001$ ), greater risk of

suicidal behavior ( $z=-3.49$ ;  $p<0.01$ ), and impulsivity ( $t=-2.55$ ;  $df=118$ ;  $p<0.05$ ) compared to boys. Furthermore, considering the differences in adaptive and maladaptive cognitive emotion regulation strategies (Garnefski et al., 2001), girls presented a greater tendency to use maladaptive strategies ( $z=-2.92$ ;  $p<0.05$ ). Table 1 shows the results of the comparison according to gender.

### Associations between study variables: Correlational analysis

Suicidal behavior showed significant positive correlations with perceived stress, impulsivity, and maladaptive cognitive emotion regulation strategies. Moreover, it was negatively correlated with adaptive cognitive emotion regulation strategies. Similarly, perceived stress was positively correlated with impulsivity and maladaptive cognitive emotion regulation strategies, and negatively correlated with adaptive cognitive emotion regulation strategies (see Table 1). A point biserial correlation was carried out between alcohol use and suicidal behavior. Results showed a non-significant association between alcohol use in the last month and suicidal behavior risk ( $r=0.053$ ,  $p=0.561$ ).

### Problematic alcohol use as a moderator between perceived stress and suicidal behavior risk

Moderation was performed by selecting Model 1 from the PROCESS macro for SPSS (Hayes, 2022). Following standard procedures, 10,000 bootstrap samples and 95% confidence intervals were selected. Gender was considered as a covariate since previous studies have suggested differences between boys and girls in suicidal behavior (e.g. Miranda-Mendizabal et al., 2019; Table 2).

Results showed that the full moderation model for the total sample was statistically significant ( $F[11.43]=10.83$ ,  $p<0.001$ ). In addition, the main effects of stress ( $b_1=0.32$ ,  $t=5.11$ ,  $p<0.001$ ) and alcohol use ( $b_2=-6.05$ ,  $t=-2.04$ ,  $p=0.043$ ) were significant. Moreover,

**Table 1.** Means, standard deviations, mean comparison tests disaggregated by gender, and Pearson's correlations for study variables.

Measure	Boys		Girls		t/U	p	d	1	2	3	4	5
	M	SD	M	SD								
1. PSS	18.16	6.24	24.75	6.89	-5.25	0.001	1	-				
2. SBQ-R	4.71	2.67	7.11	4.14	-3.49	0.001	0.688	0.50**	-			
3. Impulsivity	16.80	5.99	19.59	5.68	-2.55	0.012	0.478	0.40**	0.27**	-		
4. CERQ-18 adaptative	3.42	0.83	3.41	0.69	-0.29	0.995		-0.20**	-0.28*	-0.12	-	
5. CERQ-18 maladaptive	2.67	0.78	3.07	0.60	-2.92	0.002	0.574	0.48**	0.35**	0.42**	-0.30**	-

N=120 (N=45 for boys, N=75 for girls).

PSS: Perceived Stress Scale; SBQ-R: Suicidal Behavior Questionnaire-Revised; CERQ-18: Cognitive Emotion Regulation Questionnaire; CERQ-18-adaptive strategies (acceptance, positive reappraisal, refocusing on planning, positive refocusing, and putting into perspective); CERQ-18-maladaptive strategies (rumination, catastrophizing, self-blame, and blaming others; d: Cohen's d.

\*p<0.05. \*\*p<0.01.

**Table 2.** Results obtained through PROCESS examining the moderating effect of alcohol use.

	B	SE	R <sup>2</sup>	t	95% CI
SB risk (Y)			0.28***		
Constant	-2.49	1.60		-1.56	-5.65 to 0.68
PS (X)	0.32***	0.06		5.11	0.19 to 0.44
Alcohol use (W) <sup>a</sup>	-6.05*	2.96		-2.04	-11.92 to -0.19
PS × alcohol use (XW)	0.25*	0.12		2.11	0.01 to 0.48
Gender (C)	0.79	0.67		1.18	-0.54 to 2.12

SB: suicidal behavior risk; PS: perceived stress; Y: dependent variable; X: independent variable; W: moderator; C: covariate.

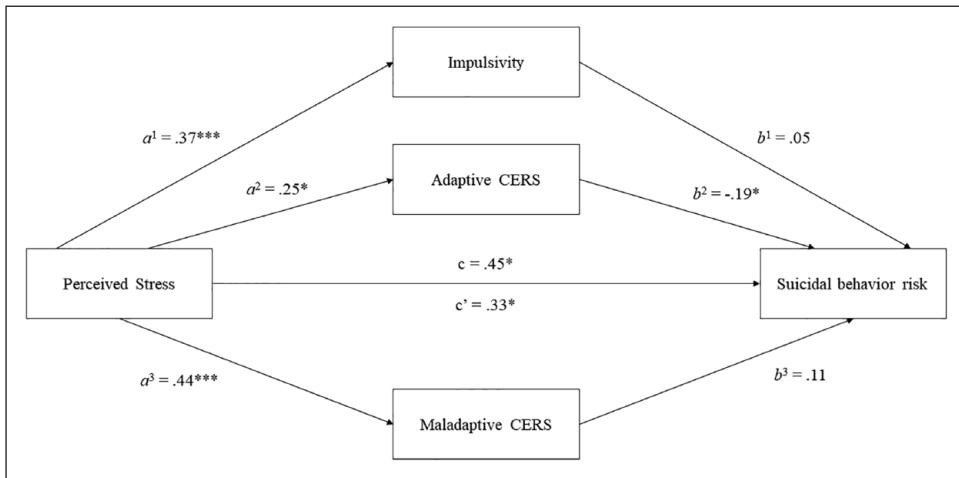
<sup>a</sup>Low alcohol use=non consumption or 1 day of consumption in the last month and high alcohol use=two or more days of consumption in the last month.

\*p<0.05. \*\*p<0.001.

the interaction between stress and alcohol use was a significant predictor of suicidal behavior risk ( $b_3=0.25$ ,  $t=2.11$ ,  $p=0.038$ ). Specifically, although results were significant for both low alcohol use ( $b=0.20$ ,  $t=3.95$ ,  $p<0.001$ ) and high alcohol use ( $b=0.44$ ,  $t=4.01$ ,  $p<0.001$ ), the slope appeared steeper among adolescents who got drunk two or more days in the last month (high alcohol use) compared to those who did not or consumed only 1 day (low alcohol use). Thus, the impact of stress on suicide risk was stronger for those with high levels of alcohol use. See Supplemental Table for all the mediation effects.

### *Impulsivity and cognitive emotion regulation strategies as mediators between perceived stress and suicidal behavior risk*

Mediation analysis was performed by selecting Model 4 from the PROCESS macro for SPSS (Hayes, 2022). This procedure allows indirect effects to be explored using a resampling method (bootstrapping). To identify a possible mediating effect, the CI of the indirect effect should not include zero. Previously, the scores of the included variables were standardized ( $z$ -scores). Following standard procedures,



**Figure 1.** Illustration of the mediation model.

a: effect of the predictor on mediators; b: effect of mediator on the outcome; c: total effect; c': direct effect; CERS: cognitive emotion regulation strategies. \* $p < .05$ , \*\*\* $p < .001$

10,000 bootstrap samples and 95% confidence intervals were selected. Gender was considered as a covariate since previous studies have suggested differences between boys and girls in suicidal behavior.

Results revealed that adaptive strategies mediated the association between perceived stress and suicidal behavior. Paths  $a_1$  and  $b_1$  were significant, indicating a negative association between perceived stress and adaptive strategies ( $b=-0.25, p < 0.05$ ) and a significant negative association between adaptive strategies and risk of suicidal behavior ( $b=-0.19, p < 0.05$ ). Moreover, the indirect effect of perceived stress and suicidal behavior risk through adaptive strategies ( $a_1b_1$ ) remained significant ( $b=0.05, 95\% \text{ CI}=0.003-0.13$ ). There were no significant indirect effects for maladaptive strategies and impulsivity (Figure 1). See Supplemental Table for all the mediation effects.

## Discussion

The purpose of this study was to analyze the possible relationship between perceived stress and suicidal behavior risk in a sample of Spanish adolescents. Furthermore, it was

designed to explore possible underlying mechanisms that could be influencing this relationship, testing the mediating roles of impulsivity and cognitive emotion regulation strategies and the possible moderating role of problematic alcohol use in this association.

Regarding the first hypothesis, the results supported the notion that adolescents who presented higher levels of perceived stress were at greater risk of suicidal behavior. These results corroborate the findings of a great deal of previous work in young people (Chen and Kuo, 2020; Hirsch et al., 2019), which suggests that stress would become an important risk factor involved in suicidal behavior. In relation to gender, girls presented a greater risk of suicidal behavior compared to boys, coinciding with those obtained in other studies with adolescent populations (Poudel et al., 2022; Uddin et al., 2019). The relationship between gender and suicide is an issue that has been addressed throughout the literature (e.g. Chang et al., 2019). Studies would suggest higher prevalence of suicide deaths in men compared to women, while women would experience a higher prevalence of suicidal ideation and/or attempts (e.g. Miranda-Mendizabal et al., 2019). These differences have been associated

with different possible explanations, such as gender inequalities or a greater use of more lethal methods and a less tendency to seek for psychological help by men compared to women (Rutz and Rihmer, 2021). However, other authors ask for caution in understanding gender differences in suicidal behavior, arguing the need to take on a sociocultural perspective. For example, these results are those observed mostly in Western countries, while in other countries (e.g. China) the rate of death by suicide is higher in women (Laso et al., 2023). Thus, the gender-suicide relationship is an issue that continues to require greater understanding and critical analysis. Finally, it should be considered that the sample was composed mostly of girls, which could also have contributed to biased results.

Regarding the second hypothesis, the results revealed a significant interaction between perceived stress and alcohol use as predictors of suicidal behavior risk, confirming the hypothesis. The perceived stress-suicidal behavior effect was more pronounced in high alcohol use consumers, that is, in those adolescents who used alcohol two or more days in the last month, the relationship between perceived stress levels and suicidal behavior risk was more striking compared to those who did not. This finding broadly supports the work of other studies in this area that identify alcohol as a risk factor for suicidal ideation and suicide attempts in young people (Carballo et al., 2020; Rubio et al., 2020; Sellers et al., 2019) and suggests that problematic alcohol use during adolescence could strengthen the relationship between perceived stress and suicidal behavior. This could be linked to the idea that alcohol use could be a coping mechanism under stressful situations that leads to serious long-term consequences (Grigsby et al., 2016; Romano et al., 2021). These findings highlight the importance of implementing evidence-based preventative educational programs aimed at training coping and emotional regulation skills and developing functional coping, which in turn could translate into responsible consumption and decreased suicidal behavior risk. In this sense, working on

social, behavioral, emotional, and cognitive skills have been suggested as components that can increase the effectiveness of prevention programs focused on problematic use of alcohol and other substances (Sánchez-Puertas et al., 2022). Thus, the role of prevention during the first stages of adolescence could be a key element to reduce problematic alcohol consumption and could provide adolescents more resources to deal with difficult situations in a healthier way.

Contrary to our expectations, impulsivity did not mediate the relationship between perceived stress and suicidal behavior risk, thus, we rejected our third hypothesis. This finding may be explained by the idea that impulsivity would be associated with suicidal behavior risk through other mechanisms. However, a note of caution must be added here since the total risk of suicidal behavior was used, whereas past researchers have found associations with specific components of suicidal behavior (Auerbach et al., 2017; Hadzic et al., 2020). Therefore, more research is needed to fully understand the underlying mechanisms that could explain the relationship between these constructs in adolescents.

Finally, only adaptive strategies showed a mediating role between perceived stress and suicidal behavior risk, partially confirming the fourth hypothesis. This pattern of results is consistent with the previous research (Qian et al., 2022; Quintana-Orts et al., 2020) and with other studies that analyzed this relationship with perceived emotional regulation strategies (Domínguez-García and Fernández-Berrocal, 2018; Gómez-Romero et al., 2020). This could imply that a lower tendency to use these strategies in stressful situations could lead to the development of risky behaviors. Additionally, the results support the conceptualization of these strategies as important for guaranteeing psychological well-being (Extremera et al., 2020). On the other hand, maladaptive strategies did not act as mediators between perceived stress and suicidal behavior risk. A similar pattern of results was found by other studies on adolescent population (Qian et al., 2022;

Quintana-Orts et al., 2020). This could imply that a lower tendency to use adaptive strategies would be more relevant than the use of maladaptive strategies in the stress-suicidal behavior association in young people. However, we considered general adaptive and maladaptive categories. It would be interesting to account for specific strategies in future studies to have a comprehensive view about how these specific emotion regulation strategies could be influencing suicidal behavior under stressful situations.

These findings could have implications for suicidal behavior prevention, suggesting the importance to use those emotion regulation strategies that could allow adolescents to cope with stressful situations in a healthy way. Empirical research has shown that focusing on increasing adaptive emotion regulation, could provide more coping resources to adolescents to avoid engaging in suicidal behavior and in problematic alcohol use (Williams and Hasking, 2010). In this sense, it could be interesting to introduce emotional competencies in school curriculums in early secondary courses (12–13 years old), since it could broaden the ways of dealing with complicated situations, improve the quality of interpersonal relationships or even increase adolescent's well-being. Finally, understanding the elements that can influence adolescents to exhibit suicidal behavior is important for the design of effective intervention strategies that could prevent many avoidable deaths, as a multifactorial perspective is vital to understanding this phenomenon.

### ***Limitations and future research***

There are potential limitations concerning the results of this study. The cross-sectional nature of the study would not allow causal relationships to be established between the constructs. Other limitations would be related to the use of self-reported questionnaires, which may have biased the findings. Future research should also replicate and extend our results by conducting longitudinal studies, with larger and more balanced samples to reach more solid conclusions, because experimental studies of problematic

substance use would not be ethical. On the other hand, suicidal behavior is a complex and multifactorial problem and we only have considered some of the risk and protection factors that may influence the development or maintenance of suicidal behaviors in adolescents. Although these designs can help to identify general variables to be considered influencing suicidal behavior (e.g. for prevention programs), it is necessary to adopt a holistic perspective and avoid reductionist explanations.

### **Conclusion**

The aim of the present research was to examine the association between perceived stress and suicidal behavior risk in a sample of adolescents. In addition, the study was designed to investigate the possible mediation roles of impulsivity and cognitive emotion regulation strategies, and the possible moderation role of alcohol use in the perceived stress-suicidal behavior association. The findings indicated that participants who reported higher levels of perceived stress presented higher suicidal behavior risk. Another major finding was the moderating role of problematic alcohol use, indicating that a problematic alcohol consumption potentiated the relationship between perceived stress and suicidal behavior. Finally, only adaptive strategies acted as a mediator between the constructs. In this sense, results highlighted the relevance of cognitive processes involved in emotion regulation under stressful situations, suggesting the relevance to train emotional skills during adolescence. In addition, it would be important to encourage adolescents to consume in a more responsible way through prevention programs, providing more healthy ways to deal with difficult situations.

### **Author contributions**

QB and JTL designed the research study. QB and JTL collected the data and performed the data analysis and its interpretation. QB, JTL, MJG, and AC wrote the paper. All authors reviewed and approved the final manuscript.

## Data sharing statement

The current article is accompanied by the relevant raw data generated during and/or analyzed during the study, including files detailing the analyses and either the complete database or other relevant raw data. These files are available in the Figshare repository and accessible as Supplemental Material via the Sage Journals platform. Ethics approval, participant permissions, and all other relevant approvals were granted for this data sharing.

## Declaration of conflicting interests

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## Ethics approval

The present study has been approved by the Commission of Ethics in Animal and Human Experimentation (CEEAH) of the Autonomous University of Barcelona (ref. number CEEAH 3850). Each participant gave written informed consent prior to the interview date.

## Pre-registration

This study was not pre-registered.

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