



# Detecting the risk of suicidal-related behaviours in teenagers by means of combined personality dimensions

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## ABSTRACT

Suicide is one of the main causes of death among teenagers (World Health Organization; WHO, 2019). Suicidal-related behaviour (SRB) (suicidal ideation and suicidal intent/self-harm behavior) is one of the main risk factors for suicide. Hence the importance of detecting predictive variables of SRB. The main purpose of this study was to analyze the association and explanatory power that combined dimensions of personality in comparison with uncombined dimensions in relation to SRB. Participants were 1027 teenagers (girls 62.2%) aged between 13 and 18 (mean age = 15.59; SD = 1.29). Personality dimensions were assessed with the Big Five Inventory and the SRB with the Youth Self Report. Neuroticism combined with the remaining personality dimensions, is associated with better predictions of SRB than the uncombined dimensions. The relative risk (RR) of SRB combining personality dimensions were high (RR = 10 in some of these combinations) and the explanatory power of some of them reaches 23%.

The role of the Openness dimension in relation to SRB is discussed, a role that until now has had little consensus in the scientific literature. In conclusion, taking into account several personality dimensions simultaneously is a useful approach to identify adolescents with a higher risk of reporting behaviour associated with suicidality. Likewise, these results will assist in the development of preventive and intervention policies.

## 1. Introduction

Suicide is a complex and multi-causal phenomenon and has become a serious public health problem worldwide (Bradley, 2016). According to the World Health Organization (WHO, 2019) about 800,000 people lose their life to suicide each year, and there are even more attempts for each completed suicide. Suicide is the third leading cause of death among adolescents aged 15 to 19. According to the National Institute of Statistics (INE), there were 3,539 deaths from suicide in Spain in 2018, of which 286 corresponded to young people under 30 years of age.

These alarming data makes the study of suicide-related behaviours (SRB), a concept that encompasses thoughts, self-injurious behaviours and suicide attempts (Li et al., 2016), a topic of great interest, especially given its relationship with completed suicide (Mars et al., 2019). A meta-analysis of 52 studies found that the strongest correlation of suicide attempts were, among others, suicidal ideation (Victor & Klonsky, 2014). One third of adolescents who have suicidal thoughts continue with a suicide attempt (Nock et al., 2013). Mars et al. (2019) claimed that 12% of adolescents with suicidal thoughts and 12% who had

engaged in self-injurious behaviours reported attempting suicide. Differences have been found in SRB according to gender. Women present more suicidal ideation and more suicide attempts (Im et al., 2017) while men present more completed suicide (Miranda-Mendizabal et al., 2019).

To prevent and intervene in SRB, it is of great importance to identify predictive or associated psychological variables. One of the predictors analyzed in the literature is personality (Li et al., 2014). One of the most consensual definitions of this construct is the one proposed by Allport (1961): "Personality is the dynamic organization within the individual of those psychophysical systems that determine his characteristic behavior and thought" (p. 28). Carver and Scheier (1997) added to this definition: "Personality is the dynamic organization within the individual of those psychophysical systems that determine characteristic patterns of behavior, thought and feelings" (p.5).

Personality traits have been a particular focus of interest since the development of the Big Five Personality Traits Model (BFPTM; Costa & McCrae, 1988). McCrae and Costa (1999) understand personality as a series of basic behavioural tendencies that influence thoughts, emotions and actions. Their origin is biological and they develop from childhood

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until they become stable structures in adulthood. Based on this model, personality is classified into five dimensions: Extraversion (E), Agreeableness (A), Conscientiousness (C), Neuroticism (N) and Openness (O). According to trait theory, personality has a certain stability through time and situations.

The rationale for this study is based on the idea that if personality confers a relatively stable way of thinking, feeling and acting, it is possible that it influences reactions to life events. One of these forms of reaction to adversity could be SRB. Several studies that have aimed to relate personality traits and SRB have found that Neuroticism and Introversion are the dimensions that pose the greatest risk for SRB (Carballo et al., 2020) and have identified Extraversion as a protective factor (Blüml et al., 2013).

The remaining personality dimensions have been less studied, but a low level of Agreeableness and a low level of Conscientiousness have been associated with suicidal ideation (Mullins et al., 2013). The role of Openness in regards to SRB remains unclear (Szücs et al., 2018): some authors found that high levels of Openness were associated with suicidal ideation (Blüml et al., 2013) as well as with self-injurious behaviour (Brown, 2009; Mullins et al., 2013). Other authors have found that adolescents with high levels of Openness reported fewer suicides (Singh & Pathak, 2017).

The relationship between personality traits and SRB appears to be influenced by gender (Rozanov & Mid'Ko, 2011): in women, SRB is associated with a high level of Neuroticism, while in men it is associated with low Conscientiousness (Blüml et al., 2013). Despite the abundant literature on the relationship between personality and SRB, to our knowledge very few studies have simultaneously analysed several personality traits. The most methodologically similar work to ours is that of Fang et al. (2012) since it is the only one that combined two personality dimensions (Neuroticism and Extraversion) in the same individual. These authors analysed a population of 64 clinical adult subjects from rural China. Their results indicated that the combination of high Neuroticism together with low Extraversion, is the pattern of personality with the highest risk of completed suicide.

When we define people, we are combining several traits at once, so it seems logical that this should be considered when analysing an individual's risk of SRB. The aim of the present study was to determine the role of personality in identifying the risk of SRB in a sample of teenagers from the general population. The theoretical framework is inscribed in the BFPTM and its concept of personality styles: the combination of two personality traits simultaneously from the same individual (Costa & McCrae, 1988; Costa & Piedmont, 2003).

This general aim was broken down into three specific objectives: a) to analyse the association between SRB and each of the five dimensions of personality of the Big Five Inventory (BFI), establishing the relative risk (RR) of SRB. From the referenced bibliography, we expected certain dimensions of personality to be associated to a greater extent than others with SRB, and for Neuroticism to show one of the strongest associations. b) To analyse the association between SRB and the simultaneous combination of different personality dimensions (combined personality dimensions). We expected the combination of personality dimensions to be associated to a greater extent and lead to a higher RR of SRB than the uncombined dimensions. c) To determine the explanatory power of the uncombined versus combined personality dimensions in the SRB. The underlying hypothesis was that the combined dimensions would have greater explanatory power for SRB.

As a preliminary step and a complementary descriptive objective, the main variables of the study were characterized for the total population and according to gender: both the personality profile of the participants and the percentage of SRB were estimated.

## 2. Material and methods

### 2.1. Participants

The sample comprised 1027 teenagers (girls 62.2%) aged 13 to 18 years ( $M_{\text{age}} = 15.59$  years,  $SD = 1.29$ ) from ten schools in Barcelona and surroundings (Spain). Regarding types of schools, seven are state-funded and three are charter schools. Among the participants, 51.8% were in compulsory secondary school education, 45.3% in higher secondary school education, and 2.9% in vocational training. The majority was born in Spain (84.6%). The age, ethnic group and types of schools of the participants matched that indicated in the "Institut d'Estadística de Catalunya" [IDESCAT (2014–2015)]. The Statistical Institute of Catalonia (IDESCAT) is the institution responsible for official statistics of Catalonia. It is a regional administrative body with legal identity, administrative and financial autonomy, and full capacity to act within its areas of competence, in accordance with Law 23/1998, on statistics in Catalonia. Based on the Hollingshead Four-Factor Index, the SES of the participants' families was as follows: 14.1% low, 20.1% medium-low, 20% medium, 32.1% medium-high and 13.7% high. Regarding the level of employment, 86.5% of the participants' fathers and 79.3% of their mothers were working, 9.3% of their fathers and 17.5% of their mothers were unemployed, and 4.2% of their fathers and 3.2% of their mothers were pensioners. The majority of participants (80%) were living with their biological parents.

### 2.2. Measures

An ad hoc socio-demographic data sheet was used to obtain information on age and the socioeconomic status of the students participating in the study. The Spanish version (Benet-Martínez & John, 1998) of the BFI (John et al., 1991) was used to assess the five personality dimensions (Costa & McCrae, 1988). Participants rate each of the 44 items that make up the inventory on a 5-point Likert scale ranging from 1 (disagree strongly) to 5 (agree strongly). In the present study, the internal consistency (Cronbach's  $\alpha$ ) fluctuated between good and acceptable: Extraversion ( $\alpha = 0.80$ ), Agreeableness ( $\alpha = 0.62$ ), Conscientiousness ( $\alpha = 0.77$ ), Neuroticism ( $\alpha = 0.70$ ) and Openness ( $\alpha = 0.75$ ). The means obtained in the current study do not differ significantly from those found in the Spanish adaptation (Benet-Martínez & John, 1998) with a sample of 894 undergraduate students (mean age = 21,  $SD = 3.3$ ): Extraversion Cohen's  $d = 0.21$ ; Agreeableness  $d = 0.12$ ; Conscientiousness  $d = 0.43$ ; Neuroticism  $d = 0.34$ ; Openness  $d = 0.46$ .

The Spanish adaptation (Abad et al., 2002) of the *Youth Self Report* (YSR; Achenbach & Rescorla, 2001) was used to assess SRB. The YSR is a self-report that measures emotional and behavioural problems in children and adolescents between 11 and 18 years old. It uses 112 items scored on a 3-point Likert scale ranging from 0 (not at all) to 2 (very often) to assess how often each of the item statements happened to teens within the previous 6 months. For the purpose of the current work, items 18 (I deliberately try to hurt or kill myself) and 91 (I think about killing myself) were used as indicators of SRB. In the current sample, the internal consistency of items 18 and 91 through Cronbach's alpha was 0.73. Pearson's correlation between these items was  $r = 0.60$ .

The fact that these two YSR items were exclusively used to assess SRB can be justified both from a theoretical-methodological point of view, as well as from an operational point of view. From a theoretical-methodological point of view, numerous authors state that if the construct being evaluated is sufficiently concrete or unambiguous for the respondent, a single-item measure may suffice. (See Sauro, 2018 for a review). On the other hand, from the operational point of view, there are several studies that have used these same two items to assess SBR (see, for example, Kirchner et al., 2011; Soler et al., 2013; Suárez-Soto et al., 2018).

2.3. Procedure

The headmasters of various educational centres were contacted by phone or in person. In those who agreed to participate, an interview was carried out with the directors, head of studies and/or psychologist, or pedagogue of the centre in order to explain the project, its structure, its timing and the type of tests to be administered. Subsequently, an information session was held with the students in order to explain the project and motivate them to participate. They were given an informed consent form for their parents or legal guardians, which had to be returned, duly signed, on the day of data collection. Participation was voluntary and anonymous. The different questionnaires were applied collectively in the classroom to groups of 20–30 teenagers in a session lasting around 2 and a half hours. Special attention was paid to ensure the privacy and confidentiality of the data, and to avoid random answers. Two members of the research team were present in the classroom to clarify any doubts and help if necessary. At the end of the questionnaires, a clear written message was provided, offering the participants counselling or professional advice if they wanted it. The present study is part of a broader research on psychological vulnerability in adolescence. The Bioethics Committee of the University of Barcelona in Spain (CBUB) approved it on 6/10/2014. The CBUB is an ethics committee recognized by the USA National Health Service (NHS). The reference number of Institutional Review Board is: IRB00003099. This study also complied with the guidelines of the Declaration of Helsinki (2017) and the legislation on the protection of confidential data.

2.4. Data analysis

To characterize the BFI’s personality dimensions, the means (*M*), the standard deviations (*SD*) and the empirical ranges were calculated. The differences between genders were tested using Student’s *t*-test, applying Levene’s test for equality of variances. Cohen’s *d* was used to estimate the effect size.

SBR was coded as SBR = 1 (presence of either suicidal thoughts or suicide attempts/non-suicidal self-injury or both), and SBR = 0 (absence of any of these concepts). The % for total sample, for girls and for boys was calculated, and gender differences were tested with Chi-square. The Relative Risk (RR) was used to calculate the likelihood of reporting SRB according to gender.

The raw scores of the five dimensions assessed by the BFI were converted into quartiles (Q) in order to be able to categorize and compare the extreme levels of each of them: (Q1 = the lowest pole, and Q > 3 = the highest pole i.e. the 25% of the sample with the highest scores in the dimensions). Chi-square was used to determine the association between each of the uncombined personality dimensions and SRB. This calculation enabled identification of the personality dimension most associated with SRB: Neuroticism in the present study. For each of these uncombined dimensions, the RR of SRB was calculated.

Then, the personality dimension most associated with SRB (Neuroticism) was combined with the quartiles of the remaining dimensions, giving rise to the combined personality dimensions: N + E; N + A; N + C; N + O. Chi-square was used to determine the association between each of these combined personality dimensions and SRB. The adjusted standardized residuals were used to identify the quartiles most associated with SRB. The cross tables demonstrated the distribution of frequencies in each quartile of the combined personality dimensions according to SBR = 0 and SBR = 1. This made it possible to identify the profiles with the highest risk of SBR, as well as those with the highest protection, and thus the RR was calculated.

Finally, ten logistic binary regressions were employed to estimate the explanatory power of both uncombined (five regressions) and combined (five regressions) personality dimensions on SRB. In all ten regressions the dependent variable was SBR, dichotomized and recoded in a binary way as SBR = 0 (protection quartile) and SBR = 1 (risk quartile). The independent variables for the uncombined personality dimensions were

each of the five dimensions of the BFI, dichotomized into lower and upper quartiles. The independent variables for the combined personality dimensions were each of the combinations (N + E; N + A; N + C; N + O), dichotomized as high risk/low risk combinations. High risk and low risk combinations were recorded in a binary way (low risk = 0 and high risk = 1). As Openness has two risk combinations (NQ > 3 + OQ > 3 and NQ > 3 + OQ1) a regression was carried out for each possibility.

Statistical analyses were performed with Statistical Package for Social Sciences (SPSS) software, 25.0 version and with MedCalc Statistical Software. Significance was set at *p* < 0.05.

3. Results

3.1. Characterization of the study variables

Table 1 shows the means, the SD and the empirical range for each of the BFI dimensions of the total sample and according to gender. Regarding personality, the girls obtained significantly higher mean scores on Neuroticism (*t* = 10.16, *p* < .001; Cohen’s *d* = 0.69). No significant differences were observed in the remaining dimensions. Regarding SRB, 15.6% of teenagers reported SRB. The percentage of girls (19.6%) was higher than that of boys (8.9%). [ $\chi^2$  (1, N = 1018) = 20.71, *p* < .001]. The risk of reporting SRB was double in girls [RR = 2.20 (95% CI = 1.538–3.143), *p* < .0001].

3.2. Association between uncombined and combined personality dimensions and SRB.

Table 2 shows the association between the dimensions (uncombined and combined) of the BFI and SRB, as well as the RR of SRB. As shown, the dimension most associated with SRB was Neuroticism. These results differed by gender. In boys, the only association was found between SRB and Neuroticism [ $\chi^2$  (3, N = 385) = 18.07, *p* < .001]. On the contrary, in girls there was an association with Neuroticism [ $\chi^2$  (3, N = 642) = 16.14, *p* < .001], Extraversion [ $\chi^2$  (3, N = 642) = 9.56, *p* = .023], Conscientiousness [ $\chi^2$  (3, N = 642) = 8.05, *p* = .045], and Agreeableness [ $\chi^2$  (3, N = 642) = 8.26, *p* = .041].

Since the dimension most associated with SRB was Neuroticism, it was combined with the remaining dimensions of the BFI giving rise to 4 combinations: Neuroticism & Extraversion, Neuroticism & Agreeableness, Neuroticism & Conscientiousness, and Neuroticism & Openness. From the crosstab of the chi-square output, the profile with the highest protection against SRB and the one with the highest risk were identified for each of the above combinations in order to estimate the RR. In the case of similar risk profiles, the one in which the adjusted standardized residuals were significant was chosen. It can also be seen in Table 2 that the combination of personality dimensions was more strongly associated with SRB than the uncombined dimensions. Likewise, there was a considerable increase in RR.

**Table 1**  
Mean (M), standard deviation (SD) and empirical range for dimensions of BFI. Total sample, girls and boys.

BFI personality dimensions	Number of items	Total N = 1027 <i>M</i> ( <i>SD</i> )	Girls n = 642 <i>M</i> ( <i>SD</i> )	Boys n = 385 <i>M</i> ( <i>SD</i> )
Extraversion (Range 10–40)	8	28.49 (5.64)	28.65 (5.67)	28.21 (5.58)
Agreeableness (Range 16–45)	9	34.75 (4.20)	34.67 (4.29)	34.91 (4.27)
Conscientiousness (Range 13–45)	9	28.85 (5.89)	29.22 (5.77)	28.23 (6.03)
Neuroticism (Range 8–40)	8	23.49 (5.64)	24.86 (5.51)	21.18 (5.10)
Openness (Range 17–50)	10	35.17 (6.01)	35.38 (6.05)	34.82 (5.96)

**Table 2**  
Association between BFI personality dimensions (uncombined and combined) and SRB. Relative risk (RR) of SRB.

	Association between BFI dimensions and SRB $\chi^2$	Relative risk (RR)
<b>BFI Uncombined personality dimensions</b>		
Extraversion	$\chi^2 (3, N = 1017) = 5.59, p >.05$	E (Q1) vs. E (Q > 3) N.S.
Agreeableness	$\chi^2 (3, N = 1017) = 10.02, p <.05$	A (Q1) vs. A (Q > 3). RR = 1.71 (95% CI = 1.15–2.54), $p < 0.01$
Conscientiousness	$\chi^2 (3, N = 1017) = 9.16, p <.05$	C (Q1) vs. C (Q > 3). RR = 1.69 (95% CI = 1.08–2.63), $p <.05$
Neuroticism	$\chi^2 (3, N = 1017) = 31.7, p <.001$	N (Q > 3) vs. (Q1) N (RR = 3.02 (95% CI = 1.96–4.64), $p < 0.001$
Openness	$\chi^2 (3, N = 1017) = 2.61, p >.05$	O (Q1) vs. O (Q > 3). N.S.
<b>BFI Combined personality dimensions</b>		
Neuroticism & Extraversion	$\chi^2 (3, N = 268) = 24.204, p <.001$	N (Q > 3) & E (Q1) vs. N (Q1) & E (Q > 3). RR = 9.84 (95% CI = 2.42–39.99), $p < 0.001$
Neuroticism & Agreeableness	$\chi^2 (5, N = 420) = 34.421, p <.001$	N (Q > 3) & A (Q1) vs. N (Q1) & A (Q3). RR = 7.14 (95% CI = 2.63–19.35), $p < 0.001$
Neuroticism & Conscientiousness	$\chi^2 (3, N = 297) = 10.796, p <.01$	N (Q > 3) & A (Q1) vs. N (Q1) & A (Q > 3). RR = 3.48 (95% CI = 1.76–6.88), $p < 0.001$
Neuroticism & Openness	$\chi^2 (3, N = 287) = 22.492, p <.001$	N (Q > 3) & C (Q1) vs. N (Q1) & C (Q > 3). RR = 2.77 (95% CI = 1.29–5.90), $p < 0.001$
		N (Q > 3) & O (Q > 3) vs. N (Q1) & O (Q1). RR = 10.27 (95% CI = 2.39–43.87), $p < 0.001$
		N (Q > 3) & O (Q1) vs. N (Q1) & O (Q1). RR = 9.17 (95% CI = 2.19–38.38), $p < 0.01$

N = Neuroticism, E = Extraversion, A = Agreeableness, C = Conscientiousness, O = Openness, Q1 = first Quartile; Q2 = second Quartile; Q3 = third Quartile; Q > 3 the 25% of the sample with the highest scores in the dimensions.

**3.3. Explanatory power of BFI personality dimensions (uncombined and combined) on SRB**

Table 3 shows the explanatory power of uncombined and combined personality dimensions (IV) on SRB (DV). The combined dimensions introduced corresponded to the highest and lowest risk quartiles of SRB. As can be seen, the combined personality dimensions showed greater explanatory power for SRB than the uncombined dimensions. The combination of Neuroticism with Extraversion, with Agreeableness, and with Openness respectively reached explanatory percentages around 20%. In comparison, the explanatory power of the uncombined dimensions was minimal and barely achieved significance.

**4. Discussion**

The main result of the current study, in line with the hypothesis

formulated, is that the combination of personality dimensions assessed by the BFI makes it possible to detect those teenagers with a higher risk of reporting SRB with greater precision than when using the uncombined dimensions. Although in the present study Neuroticism as a personality trait was associated with SRB, as previously reported (Batty et al., 2018), when combined with other dimensions it increased both the detection of the risk of SRB and its explanatory power.

Teenagers with a high level of Neuroticism together with a low level of Extraversion were about 10 times more likely to report SRB than teenagers with a low level of Neuroticism together with a high level of Extraversion. According to our data, 23% of the variance of SRB was explained by this combination. As stated by Mars et al. (2019), it might be that individuals who are less extraverted are more socially disconnected, and this has been shown to predict future suicide attempts in a sample of university students with non-suicidal self-harm. We believe that this disconnection can be exacerbated by high emotional instability. Fang et al. (2012) affirmed that contemplating only the Neuroticism dimension, as most studies do, is inadequate for the prediction of suicide. These authors found that combining Neuroticism and Extraversion increases the risk of suicide since the negative effect of Neuroticism is combined with pessimism, and hopelessness that are characteristic of low Extraversion.

Agreeableness, when not combined, was associated with SRB, as previously reported (Mullins et al., 2013). However, when combined with a high level of Neuroticism it became a more powerful risk factor for SRB and explained a large proportion of its variance (20%). The emotionally unstable teenager who is unkind, gets into fights, insults others, and is uncooperative is seven times more likely to report SRB than their emotionally stable peers with a high, but not extreme, degree of Agreeableness. Batty et al. (2018) stated that a high level of Agreeableness was associated with protection against suicide. Perhaps teenagers who are kind and at the same time emotionally balanced have a broader or more solid social support network than teenagers with an inverse profile. A curious fact found in the current study is that the profile of low Neuroticism and high but not extreme Agreeableness was more protective than a low level of Neuroticism and extreme level of Agreeableness. Studies with larger samples would be necessary to be able to explain this finding in a solid way.

An interesting result relates to the combination of Neuroticism and Openness. When Neuroticism was combined with Openness, the profile with the lowest risk was the one corresponding to teenagers with high emotional stability and who in turn do not seek new experiences, who are not creative and not particularly interested in art and aesthetics. On the contrary, high emotional instability leads to SRB when combined with either high or low Openness. When the level of Openness is extreme, the need to actively search for varied experiences can lead to SRB as a way to experience new paths, an idea also expressed by other authors (Blüml et al., 2013). On the other hand, when the level of Openness is extremely low, the lack of interest in novelties, art and aesthetics, and the lack of motivation to explore, may reflect a situation more typical of depressive states than of the teenager stage. Perhaps teenagers with this personality profile see SRB as a solution to their problems. This last explanation could be supported from the cognitive perspective (Meiran et al., 2011), from which it can be argued that low Openness might relate to depression. Therefore, teenagers with a high level of emotional maladjustment could arrive at SRB in two ways: through the active search for new experiences, or due to the limitations of their mental world. Our study highlights that the lack of consensus in the scientific literature regarding the role played by high or low Openness in predicting SRB could be due to the fact that the role played by Neuroticism has not been considered.

Finally, teenagers with low level of Conscientiousness were at higher risk of SRB than teenagers with a high level of Conscientiousness, in line with other studies (Singh & Pathak, 2017). The combination of high Neuroticism and low Conscientiousness increases the risk of SRB almost three times compared with the opposite profile. One of the possible

**Table 3**

Binary logistic regression of BFI uncombined and combined personality dimensions (independent variables) on SRB (dependent variable).

Big five inventory	B	S.E	Wald	df	Sig	Exp (B)	95% CI		R <sup>2</sup> Nagelkerke
							Lower	Upper	
<b>Uncombined personality dimensions</b>									
Extraversion (Q1 vs. Q > 3)	-0.137	0.083	2.72	1	0.099	0.87	0.74	1.03	0.009
Agreeableness (Q1 vs. Q > 3)	-0.322	0.119	7.28	1	0.007	0.73	0.57	0.92	0.02
Conscientiousness (Q1 vs. Q > 3)	-0.205	0.087	5.60	1	0.018	0.81	0.69	0.97	0.02
Neuroticism (Q1 vs. Q > 3)	0.434	0.085	26.21	1	0.000	1.54	1.31	1.82	0.08
Openness (Q1 vs. Q > 3)	0.033	0.082	0.16	1	0.69	1.03	0.88	1.22	0.001
<b>Combined personality dimensions</b>									
N(Q > 3) + E(Q1) & N(Q1) + E(Q > 3)	2.629	0.758	12.03	1	0.001	13.86	3.14	61.24	0.23
N(Q > 3) + A(Q1) & N(Q1) + A(Q3)	2.288	0.550	17.31	1	0.000	9.86	3.35	28.97	0.20
N(Q > 3) + C(Q1) & N(Q1) + C(Q > 3)	1.231	0.455	7.32	1	0.007	3.43	1.40	8.36	0.08
N(Q > 3) + O(Q > 3) & N(Q1) + O(Q1)	2.590	0.790	10.76	1	0.001	13.33	2.83	62.68	0.24
N(Q > 3) + O(Q1) & N(Q1) + O(Q1)	2.445	0.767	10.16	1	0.001	11.53	2.56	51.82	0.19

Q1 = first Quartile; Q3 = third Quartile; Q > 3 = the 25% of the sample with the highest scores in the dimensions. N = Neuroticism, E = Extraversion, A = Agreeableness,

C = Conscientiousness, O = Openness. The combinations with the highest RR were included.

explanations of the relationship between Conscientiousness and SRB was provided by the meta-analysis conducted by [Bogg and Roberts \(2004\)](#), who highlighted the relationship of Conscientiousness with health-related behaviours. As stated by these authors, people with a low level of Conscientiousness adopt habits of greater risk to health (drinking, smoking, drug abuse), which in our opinion can lead to SRB since the relationship between suicide in young people and alcohol abuse and tobacco dependence has been proven ([Wu et al., 2004](#)).

Another interesting idea was suggested a few decades ago by [Friedman et al. \(1995\)](#). These authors suggested that conscientious children might be better prepared both psychologically and pragmatically to cope with stressful life events. Their personal relationships and social networks may be more stable and secure. In our opinion, all these circumstances can become protective factors for SRB, since the literature has highlighted the moderating role of social support in the relation between stress and suicidality ([Lew et al. 2020](#)). However, it should be noted that Conscientiousness, even combined with Neuroticism, is one of the dimensions with the lowest explanatory power for SRB and a lower RR for SRB.

Taking into account personality traits is a useful approach that may prove beneficial for understanding not just momentary risk but more stable risk over the lifetime. The detection of teenagers with a higher risk of SRB by means of personality characteristics has important clinical implications and allows the implementation of preventive and interventional policies. Preventive policies must be based on an interdisciplinary approach, involving collaboration between multiple sectors of society. Among them, the media has an essential role. There is no doubt about the influence it can have on people's behaviour, especially those who are shaping their vital values, beliefs and attitudes, such as teenagers. Therefore, the media should join forces to mitigate this serious problem. [The, 2021](#) has developed a guide to prevent suicide called LIVE LIFE, the main points of which are: limit access to the means of suicide (e.g. pesticides, firearms, certain medications); interact with the media for responsible reporting of suicide; foster socio-emotional life skills in adolescents; and early identification, assessment, management and follow up of anyone who is affected by suicidal behaviours.

Regarding psychological intervention, it is not always easy to change an individual's personality, as in addition to its biological component one of its characteristics is its relative temporal and situational stability. However, what can be changed is the approach to coping with adverse circumstances. Training in the proper use of coping strategies can be a means of equipping the most vulnerable teenagers, from the personality traits point of view, with techniques to cope with events. As an example, a study by [Kirchner et al. \(2020\)](#) highlighted that teenagers who had suffered multiple victimizations (poly-victims) and who had

nevertheless preserved their psychological adjustment (resilient), used family support and positive reevaluation as coping strategies to a greater extent than teenagers with psychological symptoms (not resilient). Likewise, it would be advisable to strengthen their assertiveness in order to confront social groups that can exert a great coercive force.

## 5. Limitations and strengths

This study has a series of limitations that should be highlighted. Among them, it is worth mentioning that although the initial sample included a large number of participants, when distributed by extreme quartiles smaller groups were created that precluded analysing the data according to gender. Similarly, this fact limits the generalizability of the results. Likewise, since Neuroticism was the dimension most associated with SRB, this dimension was combined with the rest of dimensions of BFI; but other combinations that could perhaps yield interesting data were not assessed. Along the same lines, it was not possible to combine more than two personality dimensions. Future studies with a larger number of participants could go in this direction.

Another limitation refers to the research design itself. This enabled us to determine which combination of personality traits has greater explanatory power for SBR, but precluded determining how much of each of these combined traits power is explained by their overlap with other traits.

Another issue for discussion relates to the very concept of personality and associated characteristics. Although according to trait theory personality is relatively stable over time and situations, adolescence is an evolutionary period of important changes. Therefore, it is worth considering whether long-term predictions based on personality traits can be made. In our opinion, it is interesting that the perception that the teenager has of himself in a series of facets in a certain temporal cross-section, ("I see myself as someone who is talkative", "Who is relaxed", "Who worries a lot"), whether it is called personality or not, is associated with SBR. As [Costa and McCrae \(1993\)](#) stated: "the Five Factor Model is the Christmas tree on which findings of stability, heritability, consensual validation and predictive utility are hung like ornaments" (p. 302). Following on from this statement, we highlight the idea of "predictive utility", even if it is only short term. And following on from [Millon et al. \(2000\)](#) statement ("... an unusually agreeable infant is unlikely to develop an antisocial personality", p.19), we highlight the concept of being "unlikely" to develop certain behaviours from certain styles of personality.

The use of two items to assess SRB or any other construct can also be justified. There are numerous precedents in the literature both from the methodological point of view (see for example [Sauro, 2018](#) for a

review), and from the operational point of view (Kirchner et al., 2011; Soler et al., 2013; Suárez-Soto et al., 2018).

Despite these limitations, the present work has a number of strengths. As far as we know, this is one of the few studies that simultaneously combines several personality traits to predict SBR risk. This type of study is not abundant in the scientific literature on teenagers, so it fills a gap, but also opens an interesting line of research regarding the combination of the Big Five in the prediction of SBR. The main strength of this work is the finding that using a combination of personality traits makes it easier to identify those teenagers with a higher risk of SRB and, therefore, of suicide than when using isolated traits. The detection of teenagers with a higher risk of SRB through personality characteristics has important clinical implications and allows the implementation of preventive and intervention policies.

## 6. Conclusion

Given that suicide has become one of the leading causes of death among adolescents and young people, the need to detect risk factors is essential. Detecting the most vulnerable personalities can have important clinical implications. The fact that the combined personality traits predict the risk of SRB is an important piece of information and a useful approach that may prove helpful for understanding not just momentary risk but more stable risk over the lifetime. Given that SRB can be the prelude of suicide (Yook et al; 2021), the identification of this combination of personality dimensions is an important finding for both prevention and psychological intervention.

Prevention should include training courses aimed at parents, educators and teenagers themselves. The important role of social networks in SBR must be taken into account and especially so in moments of great influence such as adolescence. Regarding intervention, although it is not easy to change to personality, precisely because of its stability, it is possible to train the most vulnerable teenagers in stress coping techniques. These techniques would aim to mitigate the impact of life events so that behaviours related to suicide are not seen by teenagers as the solution to their problems.

## Author statement

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## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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