

Suicidal Ideation in Adolescents Assessed with the Three-mode Component Approach

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ABSTRACT

The study presents the development of an instrument to assess suicidal ideation in adolescents, using a situational approach known as the three-mode approach. The questionnaire consisted of 10 positive and negative situations with family, friends or strangers, and nine responses related to positive and negative suicidal ideation. The questionnaire was administered to 435 students aged between 14 and 19 years old. The corresponding person \times situation \times response data were analyzed using a three-mode component analysis. As expected, results showed two components for the responses (Suicidal ideation and Will to live) and two components for the situations (Pleasant situations and Stressful situations). We also found two latent dimensions for persons: Negative attitude to life and Positive attitude to life. This questionnaire has the expected factors, and it shows convergent and discriminant validity with other measures of suicidal ideation, depression, life satisfaction and psychological maturity.

Key words: suicidal ideation, adolescence, three way approach.

How to cite this paper: Morales-Vives F, Dueñas JM, Cosi S, & Lorenzo-Seva, U (2019). Suicidal Ideation in Adolescents Assessed with the Three-mode Component Approach. *International Journal of Psychology & Psychological Therapy*, 19, 3, 311-322.

Novelty and Significance

What is already known about the topic?

- There is a general consensus that appropriate instruments need to be developed to detect adolescents who are at risk of suicidal behavior.
- There are no questionnaires on suicidal ideation that include a variety of situations or contexts from daily life.

What this paper adds?

- The questionnaire SIQUE to assess suicidal ideation in adolescents using a new approach based on situations.
- The new questionnaire provides additional information than traditional questionnaires, showing if some situations are troublesome for an adolescent and, therefore, may give rise to suicidal ideation.

According to the Spanish statistical office (*Instituto Nacional de Estadística*), suicide is the second leading cause of death in Spain (after traffic accidents) among adolescents aged between 15 and 19 years old (World Health Organization, 2014). Most people who attempt suicide have previously fantasized about death, so suicidal ideation is a prior step to a suicide attempt and a warning sign (Horwitz, Czyz & King, 2014). Therefore, detecting suicidal ideation is essential if suicide is to be prevented. In this respect, there is a general consensus that reliable and appropriate screening instruments need to be developed to accurately detect adolescents who are at risk of suicidal behavior (e.g., Olfson, Marcus, & Bridge, 2014).

Despite the incidence of suicide ideation and suicidal behavior, which increases significantly during adolescence (Nock *et alii*, 2008), relatively few scales have been designed specifically for this age group. The Self-Injurious Thoughts and Behaviors

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Interview (SITBI; Nock, Holmberg, Photos, & Michel, 2007) and the Juvenile Suicide Assessment (JSA; Galloucis & Francek, 2002) are among the few clinical interviews that assess multiple domains of suicide risk in adolescents. Several self-report questionnaires also assess suicidal ideation in adolescents. Many of these self-reports, such as the Columbia Suicide Screen (CTS; Shaffer *et alii*, 2004) or the Child-Adolescent Suicidal Potential Index (CASPI; Pfeffer, Jiang, & Kakuma, 2000) focus on the correlates of suicide risk found in previous empirical studies (i.e., depression, family distress, substance abuse, previous attempts, suicidal ideation, etc.), but there are others that also assess protective factors against suicide, like the Reasons for Living Inventory for Adolescents (RFL-A; Osman *et alii*, 1998), and the Multi-Attitude Suicide Tendency Scale (MAST; Orbach *et alii*, 1991).

The study carried out in adolescent inpatients by Prinstein, Nock, Spirito, & Grapentine (2001) shows that self-report measures seem to identify a higher percentage of youths with suicidal ideation than other kinds of assessment. In fact, some adolescents may find it difficult to speak about their suicidal ideation in a clinical interview, because of embarrassment, difficulty in finding the right words to explain their thoughts or feelings, etc. Furthermore, suicidal ideation is typically transitory and may be absent during clinical interview (Nock & Banaji, 2007; World Health Organization, 2014). For this reason, self-reports may provide relevant and valuable information, although they cannot substitute subsequent clinical assessment.

Taking into account that there are relatively few scales designed specifically for adolescents, in the current study we have developed a questionnaire -the Suicidal Ideation Questionnaire (SIQUE)- to assess positive and negative suicidal ideation in this age group by using a situational approach known as three-way. As far as we know, no questionnaires on suicidal ideation include a variety of situations or contexts from daily life. The advantage of including situations is that the clinician may be able to identify if there is a particular situation that is especially troublesome for the adolescent, in terms of negative feelings and a higher degree of suicidal ideation. A particular adolescent may feel more negative emotions with the family than in other contexts, because of family problems, for example, but not feel the same when he/she interacts with friends or strangers. However, another adolescent may feel more negative emotions with his/her peer group, because of peer pressure, bullying, etc. An overview of the usefulness of this approach can be found in Kiers and van Mechelen (2001). In a three-mode analysis, three kinds of component are obtained: (1) behavior components, (2) situation components, and (3) person components. The interaction between these three kinds of component is contained in a core matrix and is interpreted like a loading matrix. The test we have developed includes three kinds of typical situations that can be positive or negative for adolescents: with family, with friends, and with strangers. We expected to find differences between positive and negative situations for the whole sample, but not differences between the people involved (family, friends or strangers), because the importance of the people involved in each situation will depend on the personal experience of each person.

The questionnaire also includes a set of responses, some of them related to suicidal ideation and others related to the willing to live, for each situation. Very few questionnaires measure both positive and negative thoughts about suicidal ideation. The two best-known questionnaires are the Positive And Negative Suicide Ideation Inventory (PANSI; Osman, Gutiérrez, Kopper, Barrios, & Chiro, 1998) and the Multi-Attitude Suicide Tendency Scale (MAST; Orbach *et alii*, 1991), although they have not been

validated in Spain. Both the positive and negative factors provide information that is relevant to the assessment of suicidal ideation (Osman *et alii*, 1998). We have used the three-mode approach to assess whether there are different kinds of response (positive thoughts related to the willing to live and negative thoughts related to suicidal ideation) across the different situations (positive and negative).

Another aim is to find out the convergent and discriminant validity with other measures related to suicidal ideation, more specifically depression and satisfaction with life. Previous studies show that depression is a relevant predictor of suicidal ideation (e.g., Lasgaard, Goossens & Elklit, 2011; Sánchez Teruel, Muela Martínez, & García León, 2014), and that satisfaction with life is related to suicidal ideation (e.g., Inder *et alii*, 2014). For this reason, in the current study we expect to find a relationship between depressive symptomatology, life satisfaction and the factors obtained in the questionnaire SIQUE. We also attempted to determine if there is a relationship between psychological maturity and suicidal ideation, especially with the subscale Identity, because a coherent sense of personal identity protects against indicators of distress such as anxiety and depression (Schwartz, 2007) and it also involves higher emotional stability (Morales Vives, Camps, & Lorenzo Seva, 2013).

METHOD

Participants

Since the main aim of this research was to study suicidal ideation in adolescents, in a variety of situations, the data was collected from eight state high schools in Tarragona (España). The questionnaires were administered to 983 adolescents, but only 218 students showed some degree of suicidal ideation. For this reason, we used a randomization process, explained below, to obtain a subsample of adolescents without suicidal ideation with an equivalent size of 218 individuals, to make the comparison easier. The final sample consisted of 436 adolescents (47% boys). The age range of the subjects was between 14 and 19 years old, with a mean of 15.8 ($SD= 1.3$). The age of the 218 students with suicidal ideation (58.3% girls) was 14-19 years old, with a mean of 15.7 ($SD= 1.3$). The age of the 218 students without suicidal ideation (49.3% girls) was 14-18 years old, with a mean of 16.0 ($SD= 1.2$).

Instruments

As well as the instrument developed in the current study, the Suicidal Ideation Questionnaire (SIQUE), we administered the following instruments:

Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). BDI has 21 items with four statements that reflect various levels of depressed feelings. The internal consistency in our sample was .89. Moreover, it also contains a specific item that assesses suicidal ideation.

Satisfaction With Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985). SWLS is a unifactorial questionnaire with five items answered on a five-point Likert scale: (1) Strongly disagree, (5) Strongly agree. The internal consistency in our sample was .89.

Psychological Maturity Assessment Scale (PSYMAS; Morales Vives *et alii*, 2013). PSYMAS assesses psychological maturity in adolescents, defined as the ability to take on obligations and make responsible decisions, bearing in mind one's own characteristics and needs and accepting the consequences of one's own actions. Its 26 items are answered on a five-point Likert scale: (1) Fully disagree, (5) Fully agree. It has three subscales:

Work-orientation, Self-reliance and Identity. The internal consistencies in our sample are .82, .86 and .91, respectively, and .90 for the overall scale. Work-orientation is defined as an individual's willingness to fulfil his or her own obligations. Self-reliance is defined as the willingness to take the initiative and not allow others to exercise excessive control. Identity is defined as the adolescent's knowledge of him or herself.

Procedure

To develop the questionnaire, we first wrote a pool of responses and situations that were easy to understand for adolescents. The pool of responses included items about thoughts linked to the three facets of suicidal ideation proposed by Beck, Kovacks, and Weissman (1979): Active suicidal desire, Specific plans for suicide and Passive suicidal desire. We included situations that a typical adolescent may have to cope with at this time in their lives, positive or negative, some of them with family, others with friends and others with unknown people. This pool was assessed by nine psychologists specialized in clinical adolescent psychology. We retained nine responses (four of willing to live and five of suicidal ideation) and ten situations (three involving unknown people, four involving relatives and three involving friends) that were well qualified by the external judges.

We sent parental permission forms to all parents of students and asked them to sign and return them if they wanted their child to participate in the study. We also obtained the authorization of the high schools to administer the questionnaires.

The tests were administered collectively during regular school hours, in groups of 20-30 participants. Professional psychologists administered the questionnaires in two different sessions so as not to tire the participants. To prevent the order of the sessions from affecting the results, half of the classrooms answered the SIQUE in the first session, while the other half of the classrooms answered the other questionnaires in the first session. Therefore, students from the same classroom answered the questionnaires in the same order, which prevented them from talking between sessions about the questionnaires that their classmates had to answer afterwards. All students were guaranteed confidentiality and anonymity. In fact, none of the participants were required to give their name so that the information they provided could not be traced back to them as individuals, as we explained to them. Since we did not have the name of the students, we matched the questionnaires from the two sessions on the basis of their classgroup, sex, date of birth and favourite color. This information was elicited in both sessions, so that we could make this match. Furthermore, the data file does not include the classgroups, only an identification number for each student, also to ensure confidentiality and to avoid the possibility of identifying any particular student.

Participants were asked to indicate the extent to which they react in the way described to the situations in the SIQUE questionnaire. They first had to judge the first situation with respect to all responses, then the second situation, etc. The Appendix shows an example of the format used to present each situation to the participants.

We wanted a general community sample that contained adolescents with and without suicidal ideation so that we could compare both groups in the profiles obtained in the three-mode analysis. However, in the eight high schools from which we collected the sample, the answers to the BDI item of suicidal ideation revealed only 218 adolescents with some level of suicidal ideation. There were considerably more adolescents without suicidal ideation, so we completed the sample with adolescents randomly chosen from the eight high schools. To do so, we used the randomization function of the Excel program,

based on the identification numbers of the students without suicidal ideation. Using this function, we randomly chose 218 identification numbers, and the questionnaires of these students were included in the subsequent analysis. So, the final sample had an equivalent number of adolescents from both groups, which makes comparison easier. Taking into account that the prevalence of suicidal ideation in Spanish adolescents is not very high (Fonseca Pedrero *et alii*, 2018), we expected to find a small number of students with suicidal ideation. For this reason we decided to collect the sample in eight state high schools, in order to get a sufficient number of adolescents with suicidal ideation for this study.

RESULTS

A detailed analysis was computed for the three-way data set. In the analysis, we followed the flow-chart described in Kiers and van Mechelen (2001). We carried out a fixed effects three-way ANOVA on the $435 \times 9 \times 10$ three-way data table. From the decomposition into sums of squares, the three-way interaction plus error term contributed 10.3% of the variance. So the three-way component analysis is justified with this data set. In order to eliminate unwanted artificial scale range differences, and to equalize the importance of the variables, we normalized the response scales so that the variances of all variables were normalized to unity. A three-way component model can consider different levels of complexity (i.e., number of components). The aim is to identify the level of complexity that yields the most useful description of the data set and to balance fit and parsimony. To help us with this decision, we computed the numerical convex hull based method proposed by Ceulemans and Kiers (2006): It is a numerical method for selecting a model that has the best badness-of-fit/sum-of-components balance. Figure 1 shows the relationship between goodness of fit and complexity in our data for different models. The line in Figure 1 represents the higher boundary of the convex hull. The numerical convex hull-based model selection procedure yielded five 'hull' solutions. Table 1 shows the percentage of goodness-of-fit values (f), total number of components (s), and scree test values (st) of the solutions on the higher boundary of the convex hull. As can be seen in the table, the numerical method suggested selecting the model that considered two person components, two response components, and two

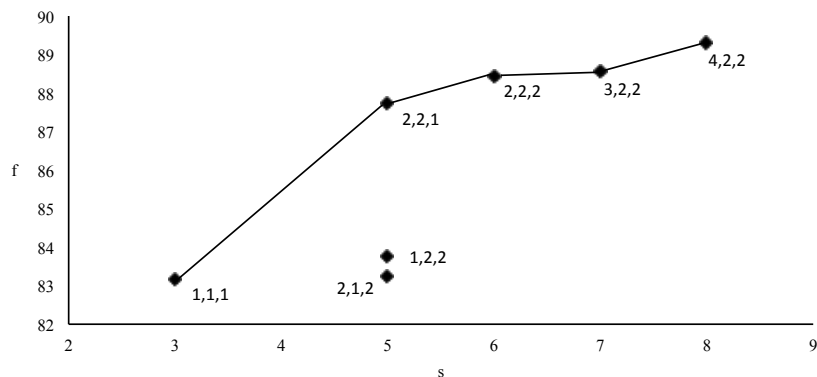


Figure 1. Plot of goodness of fit (f) versus the total number of components (s) for all the possible solutions, with the line representing the upper boundary of the convex hull.

Table 1. Percentage of goodness-of-fit values, total number of components, and screen test values of the solutions on the upper boundary of the convex hull.

Person	Response	Situation	<i>f</i>	<i>s</i>	<i>st</i>
1	1	1	83.2%	3	-
2	2	1	87.7%	5	3.13
2	2	2	88.5%	6	5.46
3	2	2	88.6%	7	0.19
4	2	2	89.3%	8	-

Notes: *f*= Percentage of goodness-of-fit values; *s*= total number of components; *st*= screen test values.

situation components, because increasing the complexity of the model by adding more components did not lead to a substantial increase in the goodness of fit.

As all the scores were related to suicidal ideation, we decided that it would make sense to allow them to correlate after component extraction. Thus the person components were renormalized, as this typically has the effect of allowing person component scores to be correlated among themselves. We decided to rotate the solution in order to obtain a simple structure in the response components, the situation components, and the core matrix. We applied Kiers' procedure (1998) a number of times for joint varimax rotation of the core and component matrices. We set the relative weights for the response and situation components to 5, and the person component to 0. The simplicity values for the response and situation components were 1.02, and 1.05, respectively. The simplicity value for the related core matrix was 1.13. We also tried other possibilities for the weights (from 6 to 10). However, the improvement in the simplicity was minimum (less than 0.01) in all the matrices. Therefore, we eventually decided to keep the solution with the initial weights. We carried out a stability check analysis. The sample was split in halves at random, and the data for both splits were pre-processed and analyzed in the same way as the full sample. The solution was quite stable: Congruence values for the response and situation components were larger than .98. To inspect the stability of the core matrix (i.e., the matrix that relates person, response, and situation components), we computed the cores for the two splits, and observed that they were very similar: Differences across splits were never larger than 2 and thus hardly affected the interpretation of the core matrices.

The analysis led to a three-way component solution that had a simple structure and was stable. Table 2 shows the component scores for the responses. Two components were obtained: The first component includes the negative responses, so it was named

Table 2. Response component scores.

Responses	Negative	Positive
1. I feel that I have reasons to live.	0	0.49
2. I would never think about ways of committing suicide.	-0.02	0.51
3. I would feel so bad that I would not mind if something happened to put my life in danger.	0.46	-0.02
4. I would feel like dying.	0.48	-0.03
5. I would make specific plans to commit suicide.	0.43	0.04
6. In this sort of situation, it is unlikely I would dare to commit suicide.	-0.02	0.51
7. I believe that the reasons for living are greater than the reasons for dying.	0.01	0.48
8. I would begin to make preparations to commit suicide.	0.41	0.06
9. I would not take any steps that were necessary to save my life.	0.45	-0.01

Note: Responses translated from Spanish using the back translation method. The original in Spanish can be obtained from the authors.

suicidal ideation; the second component includes the positive responses that imply a will to live, so it was named Will to live.

Table 3 shows the component scores for the different situations. The first component involves all those negative situations with relatives, friends and unknown people, so it

Table 3. Situations component scores.

Situations	Stressful	Pleasant
1. You have managed to get some tickets for a concert by a group that you like a lot, but to punish you for something you have done your parents won't let you go.	0.46	-0.01
2. You celebrate a birthday with your family and you have a happy and enjoyable evening.	0.01	0.44
3. You revise for an exam with a group of friends and you feel that you are as prepared as they are. However, everybody passes except you.	0.40	0.04
4. Someone you don't know shouts at you and insults you for doing something wrong.	0.32	0.12
5. You do something wrong but your family react by defending you, thus showing that they trust you and love you.	0.06	0.39
6. You are with your friends and one of them makes fun of your physical appearance.	0.48	-0.04
7. You have started a summer course and you don't know anyone, but you feel that all the other participants accept you.	-0.02	0.47
8. Your parents get very angry with you. They shout and get very worked up because you have failed more subjects than they expected to.	0.53	-0.09
9. Your friends say how much they admire you for having achieved something important.	-0.03	0.48
10. You are walking along a street looking for a shop someone has told you about, when a person you don't know is very nice to you and helps you to find it.	0.03	0.42

Note: Situations were translated from Spanish using the back translation method. The original in Spanish can be obtained from the authors.

was named Stressful situations. The second component involves all the positive situations with relatives, friends and unknown people, so it was named Pleasant situations.

To interpret the person components, the core array, shown in Table 4, must be inspected. The largest values in the core matrix show the relationships between response, situation, and person components. As the table shows, each person component is strongly related to two different interactions between response and situation components. More specifically, the first component involved the will to live in stressful situations and the will to live in pleasant situations, so it was labelled Positive attitude to life. The second component involved suicidal ideation in stressful situations and suicidal ideation in pleasant situations, so it was labelled Negative attitude to life. The correlation between these person components was $-.63$, so the relationship between them is not perfectly

Table 4. Core array.

Interaction of response and situation components	Person components	
	1	2
Positive suicidal ideation x Stressful situations	95.7	-7.2
Positive suicidal ideation x Pleasant situations	91.9	4.3
Negative suicidal ideation x Stressful situations	-5.3	109.7
Negative suicidal ideation x Pleasant situations	12.7	69.6

linear (i.e., knowing the score on one of the two variables is not enough to know the score on the second variable).

Table 5 shows the correlations between the person components with the BDI, SWLS and PSYMAS questionnaires. The person component Positive attitude to life has negative correlations with depression and the BDI item of suicidal ideation, while the Negative attitude has positive correlations. Moreover, Positive attitude has a positive correlation with life satisfaction, while Negative attitude has a negative correlation. With

Table 5. Correlations between person components and BDI, SWLS, and PSYMAS.

Scales	Variables	Positive Attitude	Negative Attitude
BDI	Depression	-.31**	.40**
	Suicide ideation	-.43**	.54**
SWLS	Life satisfaction	.34**	-.28**
	Work orientation	.11	-.15*
PSYMAS	Self-reliance	.17*	-.08
	Identity	.28**	-.29**
	Overall maturity	.26**	-.25**

Notes: **= $p < .01$; *= $p < .05$.

regard to the maturity scales, Identity is the subscale that is most related to the person components: It is positively correlated with Positive attitude and negatively correlated with Negative attitude. Work orientation has a negative correlation with Negative attitude, but the correlation is small. Likewise, self-reliance is only slightly correlated with Positive attitude.

No significant differences were found between boys and girls for Negative attitude (50.3 versus 49.8, $p > .05$) or Positive attitude (49.3 versus 50.9, $p > .05$). Age has small, but significant, correlations with both person components, with a correlation of .22 for Positive attitude ($p < .01$) and -.12 for Negative attitude ($p < .05$).

DISCUSSION

The main aim of this research was to develop a questionnaire to assess suicidal ideation in adolescents using a new approach in this field based on situations: The three-way approach. This questionnaire, SIQUE, provides additional information to that provided by traditional questionnaires, because it shows whether some specific contexts or situations are more troublesome for the adolescent and, therefore, may give rise to suicidal ideation. In fact, adolescents may present more negative feelings in particular situations: For example, with parents if they have conflicts with them, or with their peer group, because of bullying or their need to be accepted. Taking into account that patients with depression and suicidal ideation often evaluate their positive experiences negatively (Beck, 1979), this questionnaire includes both positive and negative situations with friends, family and strangers. As expected, two components were found for the situations: The first component with all the negative situations, named Stressful situations, and the second component with all the positive situations, named Pleasant situations. We did not expect to find specific components for friends, family or strangers because the importance of the people involved in a specific situation will depend on the personal experience, personality and problems of each adolescent. Moreover, the results showed the two response components expected, one related to the presence of suicidal ideation and one related to the will of live. These results agree with the existence of the two kinds of suicidal ideation stated by Osman *et alii* (1998) and assessed in the questionnaire PANSI.

Finally, two person components were found, which involve two different adolescent profiles. The first profile was named Positive attitude to life and involved the will to live in both stressful and pleasant situations. The second component was named Negative attitude to life and involved suicidal ideation in both pleasant and stressful situations. Both profiles are highly related, although they are not exactly the same factor but reversed, as is shown by the correlation between them of -.63. Therefore, these

results show that there is a positive and optimistic profile even in stressful situations, while those adolescents with suicidal ideation tend to have negative feelings even in pleasant situations. These results may suggest that there is no need to include both positive and negative situations in a questionnaire. However, when assessing a specific adolescent, it may be interesting to know if the degree of suicidal ideation in pleasant situations is exactly the same as in stressful situations, because this could be a warning signal. Moreover, according to Nock and Banaji (2007), suicidal ideation is typically transitory, so it may make sense to determine which situations trigger suicidal ideation in a particular adolescent.

Regarding the convergent and discriminant validity of the SIQUE questionnaire, there is a relationship between the person dimensions found with the SIQUE questionnaire and the BDI item that assesses suicidal ideation, as it was expected: A positive correlation with the person component Negative attitude to life and a negative correlation with the person component Positive attitude to live. Moreover, as was expected, the person component Negative attitude to life has a positive correlation with depressive symptomatology and a negative correlation with life satisfaction, although the correlation is bigger for depressive symptomatology. These results are congruent with those of previous studies that show that depressive symptoms are one of the main predictors for both ideation and suicidal behavior in adults and adolescents (e.g., Lasgaard et alii, 2011; Sánchez Teruel, Muela Martínez, & García León, 2014). Previous studies show that life satisfaction is negatively related to suicidal ideation and depressive symptoms (e.g., Inder et alii, 2014; Liberman, Altuzarra, Öst, & Ollendick, 2012). It should be taken into account that life satisfaction decreases during adolescence in both males and females, so this variable is particularly relevant to this period of life, especially because adolescence is a developmental stage characterized by numerous changes at various levels that can generate a considerable amount of stress.

As far as psychological maturity is concerned, we expected to find a relationship between identity and the person components of SIQUE, because a coherent sense of personal identity protects against indicators of distress such as anxiety and depression (Schwartz, 2007). We found a negative correlation between identity and the person component Negative attitude to life, and a positive correlation with the person component Positive attitude to life, which is congruent with the protective role of identity.

Although in this study we included all the different responses for each of the situations, regardless of whether they were pleasant or stressful, the results show that the test can be simplified. In fact, each element of the situation components loads mainly on one of the components, as is the case with the elements of the response components. Likewise, the core matrix also shows two quite different profiles of adolescents. Therefore, overall scores can also be obtained taking into account only the positive responses for the pleasant situations and only the negative responses for the stressful situations. (this simplified version of the test can be downloaded at <http://psico.fcep.urv.cat/questionaris/sique/index.html>). The test can also be administered by computer, and the overall scores for each component and the normalized percentiles can be computed through this website.

To summarize the results reported above, three-mode analysis has shown its value as a tool for developing a new approach to assessing suicidal ideation in adolescents, which can be particularly useful to further refine the detection of suicidal ideation and situations that can trigger or stop it. The questionnaire SIQUE shows convergent and discriminant validity, and it provides information about adolescence that traditional

self-report measures do not assess. However, further studies must be made in order to know whether these results are replicated in new samples, especially clinical ones.

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Received, May 3, 2019
Final Acceptance, July 14, 2019

APPENDIX

Example to show the format used to present each situation to the participants

Situation: Your parents get very angry with you. They shout and get very worked up because you have failed more subjects than they expected to.

	Completely disagree	Disagree	Neither agree or disagree	Agree	Completely agree
	1	2	3	4	5
I feel that I have reasons to live.					
I would never think about ways of committing suicide.					
I would feel so bad that I would not mind if something happened to put my life in danger.					
I would feel like dying.					
I would make specific plans to commit suicide.					
In this sort of situation, it is unlikely I would dare to commit suicide.					
I believe that the reasons for living are greater than the reasons for dying.					
I would begin to make preparations to commit suicide.					
I would not take any steps that were necessary to save my life.					