

Testing the Probability of a Model to Predict Suicide Risk in High School and University Students

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Abstract

Objective: The aim of this study was to investigate the validity of a model proposed by Batigün and Şahin regarding suicide probability.

Method: The sample was composed of 2343 students aged 15-25 years that were attending various high schools and universities. According to the proposed model, 2 risk groups were formed from this sample, according to their scores on the investigation variables (those that simultaneously received high scores 1 standard deviation above the mean on the Problem Solving Inventory, Multidimensional Anger Scale, and Impulsivity Scale). Two other risk groups were formed according to the criteria variable scores (suicide probability scores 1 standard deviation above and below the mean). A series of analyses were conducted to investigate the similarity between the model risk groups and criteria risk groups.

Results: The results reveal that the model had a 43.3% success rate for predicting those with high suicide probability, while the false negative rate was 0%. Discriminant analysis showed that the model correctly discriminated 90.2% of those with low suicide probability and 87.3% of those with high suicide probability.

Conclusion: The results support the validity of the proposed model for selecting individuals with high suicide probability. In addition, the model can be used to offer these individuals certain preventive measures, such as problem solving, communication skills, and anger management training.

Key Words: Suicide probability, problem-solving skills, anger, impulsivity

INTRODUCTION

The issue of suicide haunts humanity as a universal problem. The rate of suicide in Turkey is 3.30/100,000 (TUIK, Suicide Statistics, 2002). Considering this percentage and relating it to the Turkish population, the number turns out to be 2301 individuals/year. In all, 32.42% of this group (746 individuals) was 15-24 years of age. There is no doubt that suicide attempts account for a much greater number. A study conducted between 1998 and 2001 reported that the suicide attempt rate was 78.89/100,000, on average, indicating an increase of 93.59% from 1998-2001 (Özgüven and Sayıl, 2003).

The literature shows that the most frequently reported variables regarding suicide are impulsivity, anger/aggression, and inefficient problem-solving skills.

Impulsivity is defined as a cognitive function characterized by insufficient thinking and preparation before initiating an action or response (Dickman, 1990). It is reported that many suicide attempts among youth and women are characterized by impulsivity (Williams et al., 1980).

Anger and aggression are also considered among the risk factors for suicide. There are several studies in support of the connection between aggressive, impulsive behaviors and suicide (Michaelis et al., 2004; Zouk et al., 2006).

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Problem-solving skills is another variable mentioned in the related literature. The probability of attempted suicide increases for those individuals with a rigid cognitive structure and/or those with inadequate problem-solving skills (Clum et al., 1979). Studies conducted with high school and university students (Chang, 2002), and psychiatric patients (Pollock and Williams, 2004; Özgüven et al., 2003) reported that inadequate problem-solving skills, on their own or together with a number of reasons for living help predict suicide behaviors.

The above-mentioned variables were investigated in a study conducted by Batıgün and Şahin in 2003. In that study the sample was composed of 14-65-year-old individuals. The researchers asked these individuals the first solution that would come to their minds if they were faced with various stressful events. Those that reported they would commit suicide as the first solution were then compared with those that chose other solutions. This comparison revealed that the variables that discriminated those who would think of suicide as the first solution to their stressful problems were, age, anger, inadequate problem-solving skills, and impulsivity. Based on these results the researchers proposed a model that states: "Individuals 13-24 years of age that perceive themselves as deficient in problem-solving skills feel frustrated and angry when faced with events they interpret as criticism and injustice. Since this age group is also usually more impulsive, it is possible that they think of suicide as the initial solution to stressful problems. As such, it is possible to think of those with inadequate problem-solving skills that are also impulsive and angry as a risk group for suicide".

The main purpose of the present study was to evaluate the validity of this model. In addition, the researchers were also interested in determining how the variables—anger, impulsivity, and problem-solving skills—varied according to age, gender, and socio-economic status.

METHOD

Sample

The study was conducted with high school and university students in Ankara. The high school sample was composed of students recruited from 8 schools, representing 3 different socio-economic status (SES) levels, after receiving permission from the Ministry of National Education. The students were selected randomly. The researchers attempted to balance the number of

students from different classes and units of Turkish-mathematics, mathematics-science and social studies. Administration of the assessment instruments was conducted in parallel sessions by the 5 researchers during classroom hours. The university sample consisted of students randomly selected from 4 public and 2 private universities. The students were from different classes of the faculties of Arts and Sciences, Administrative Sciences, Education, Pharmacy, Law, Medicine, and Veterinary Medicine. The assessment instruments were administered either individually or in groups. In total, 3000 test forms were distributed; however, only 2343 were used for analysis. Of these, 1358 were completed by high school students and 985 were from university students. Females constituted 56.3% of the sample, whereas males accounted for 42.5%. SES was defined as the mother's level of education. Those whose mothers were illiterate and primary school graduates were considered low SES (38.4%), those whose mothers were graduates of middle and high school were considered as middle SES (42.6%), and those whose mothers were college and university graduates were considered high SES (19%). Age range of the students was 15-25 years (mean age: 18.17 ± 2.59 years).

Assessment Instruments

Suicide Probability Scale (SPS)

This 36-item, 4-point Likert-type self-report scale was developed by Cull and Gill in 1988. High scores indicate high suicide probability. The first Turkish translation and adaptation study of the scale's original form was conducted by Eskin (1993). Detailed information about this Turkish adaptation study can be found in Tüzün (1997). The scale used in the present study is a different version that was used in a study conducted by Şahin and Batıgün. Information regarding the psychometric properties of this version is given in the mentioned study.

Brief Symptom Inventory (BSI)

This is a 53-item, 4-point Likert-type scale self-report developed by Derogatis (1992) to survey psychological symptoms. High scores indicate the frequency and severity of symptoms. Adaptation of the Turkish version was investigated in 2 different studies (Şahin and Durak, 1994; Şahin et al., 2002). It is reported that the scale is composed of a 5-factor structure; namely, anxiety, depression, negative self worth, summarization, and hostility-aggression.

TABLE 1. Comparison of the “model risk groups”, in terms of the study variables.

	High-risk group according to the “model” (n = 29)		Low-risk group according to the “model” (n = 30)		t
	PSI > 109 + MMPI > 12 + Anger > 380		PSI < 76 + MMPI < 6 + Anger < 292		
	x	ss	x	ss	
Suicide Probability Scale (Total score)	86.31	10.68	59.75	6.69	11.294***
Negative self and exhaustion	48.31	7.54	35.86	5.41	7.226***
Detachment from life	15.37	2.81	11.03	3.17	5.550***
Anger	22.55	3.25	12.53	2.01	14.189***
Brief Symptom Inventory (Total score)	104.86	36.30	17.14	13.07	10.817***
Anxiety	25.54	9.79	3.69	3.53	11.133***
Depression	28.29	12.19	5.97	6.16	8.176***
Negative self	21.07	9.24	2.80	2.55	10.109***
Somatization	11.79	6.70	2.23	2.94	7.054***
Anger/Hostility	16.39	5.79	2.63	1.99	11.936***

***p < 0.001

Problem Solving Inventory (PSI)

This 35-item, 6-point Likert-type scale was developed by Heppner and Petersen (1982). It is designed to measure an individual's perception of his/her own problem-solving skills. High scores indicate the perception of one's self as inefficient at problem solving. Turkish adaptation of the instrument was studied by Şahin et al. (1993). It is reported that the inventory is composed of 6 factors; namely, impulsive (impatient) style, reflective style, avoidant style, monitoring style, confident style, and planful style.

Impulsivity Sub-Scale (MMPI)

This is a special 20-item subscale developed from the related items of the MMPI by Gough in 1957. High scores indicate the frequency and intensity of impulsive behaviors (Dahlstrom et. al., 1979). The psychometric properties of the scale were reported to be satisfactory in the previously mentioned Batıgün and Şahin study (2003).

Multi-Dimensional Anger Scale

This 5-point Likert-type scale composed of 5 dimensions was developed to measure anger-related symptoms, situations, thoughts, and behaviors, and interpersonal anger (Balkaya and Şahin, 2003). In the present study only the anger-related situations, anger-related behaviors, and interpersonal-anger dimensions were used. The anger-related situations dimension is composed of 3 subscales; namely, not being taken seriously (20 items),

being faced with injustice (17 items), and being faced with criticism (5 items). The anger-related behaviors dimension consists of 3 subscales; aggressive behaviors (12 items), trying to remain calm (10 items), and anxious behaviors (4 items). The interpersonal anger dimension is composed of 4 sub-scales; revengeful reactions (24 items), passive-aggressive reactions (10 items), internalizing reactions (10 items), and indifferent reactions (3 items). These same 3 dimensions were used in the previously mentioned Batıgün and Şahin (2003) study.

Procedure

In order to collect data from the high school students, permission from the Ministry of National Education was obtained and then the tests were administered in classrooms with the help of school counselors. After an explanation of how the forms were to be completed, the students were informed that they would complete the scales as a group, and that it was not necessary for them to provide their names. Only those individuals that preferred individual feedback about the results supplied their name and e-mail address. They were also reminded that participation was voluntary.

A similar procedure was used for the university students. In order to control for an order-effect, the instruments were placed in the battery in 4 different orders, keeping the demographic information questionnaire in the first position. Completion of the scales took 40-50 minutes.

TABLE 2. X-square test results.

SUICIDE

According to the proposed “model”		According to Suicide Probability Scale		Total
		High suicide probability	Low suicide probability	
High-risk group	Observed	13	0	13
	Expected	5.6	7.4	13
	%	43.3	0	43.3
Low-risk group	Observed	0	17	17
	Expected	7.4	9.6	17
	%	0	56.7	56.7
Total	Observed	13	17	30
	Expected	13	17	30
	%	43.3	56.7	100

RESULTS**1. Specifying the Risk Groups**

In order to evaluate the model under study, a risk group and a comparison group were formed based on anger, impulsivity, and problem solving scale scores. Mean scores and standard deviations for the 3 scales for the entire sample ($n = 2343$) were as follows: 336.60 ± 48.02 for anger, 9.54 ± 4.01 for impulsivity, and 92.31 ± 19.85 for problem solving. Considering the scores, about 1 standard deviation above and below the mean score for these 3 scales, the risk and comparison groups were formed. In other words, individuals that scored ≥ 380 on the anger scale, ≥ 12 on the impulsivity scale, and ≤ 109 on the problem solving scale, were considered to have a high risk for suicide according to the model and constituted the risk group. On the other hand, those that scored ≤ 292 on the anger scale, ≤ 6 on the impulsivity scale, and ≤ 76 on the problem-solving scale were considered to have a low risk for suicide according to the model and constituted the comparison group.

In order to evaluate the validity of the model these 2 groups were first compared to see if they differed in terms of their psychological symptoms and suicide probability. The t-test results are given below in Table 1.

As Table 1 shows, there were significant differences between the 2 groups in terms of their BSI and SPS scores. The scores of the risk group were significantly higher than those of the comparison group.

Next, assuming that SPS is a valid instrument that measures an individual's probability of suicide, an analysis was conducted to determine whether those deemed to be at risk according to the model were also at risk

for suicide according to SPS. In order to conduct this analysis, 2 different groups were formed based on SPS scores—high suicide probability and low suicide probability. This time, SPS mean score (73.07) and standard deviation (12.25) of the total sample were taken as the standard. Accordingly, those that scored ≥ 85 and over on SPS constituted the high suicide probability group, and those that scored ≤ 61 constituted the low suicide probability group. Chi-square analysis was then conducted to determine if those at risk according to the model were in the high suicide probability group based on SPS. The results are presented in Table 2.

Table 2 shows that there was a significant relationship between the risk groups according to the model and according to SPS scores [$X^2 = (1, 30) = 30, P < 0.000$]. In other words, if we take the SPS scores as the criteria for suicide, our predictive accuracy for those at high risk according to the model was 43.3%, whereas the predictive accuracy for determining those with low risk was 56.7%. In addition, none (0%) of the individuals determined to be high risk according to the model were included in the SPS low suicide probability group, and none (0%) for those deemed to be low risk according to the model were included in the SPS high suicide probability group.

One last analysis to evaluate the validity of the model concerned the discriminative power of the model variables—problem solving efficiency, impulsivity, and anger. A discriminative analysis was conducted to determine which dimensions of anger, problem solving, and impulsivity discriminated between the groups in terms of their suicide probability level. The subscales of the tests used to measure the research variables (anger,

TABLE 3. Equivalence of means test.

Variables	Standard Canonical Discriminant Function Coefficients	Structural Matrix
Avoidant style (PSI sub-scale)	0.21	0.40
Confident style (PSI sub-scale)	0.31	0.38
Being faced with injustice (anger-related situations)	-0.34	-0.13
Being faced with criticism (anger-related situations)	0.35	0.31
Aggressive behaviors (anger-related behaviors)	0.34	0.47
Passive-aggressive behaviors (anger-related behaviors)	0.-0.30	0.13
Internalizing reactions (interpersonal anger)	0.39	0.17
Impulsivity	0.65	0.71

perceived problem-solving skills, and impulsivity) were taken as the predictive variables and a function was formulated. The model explained 61% of variance of the dependent variable (canonical correlation: 0.78). All variance of the dependent variable was explained by a single function (Eigen value: 1.57) and it significantly discriminated between the groups (Wilks Lambda: 0.39 ± 8 ; $P < .001$). The discriminant function coefficients and structural matrices used to evaluate the importance of the independent variables are given in Table 3.

As Table 3 shows, avoidant, non-confident problem-solving styles, feeling intense anger when faced with injustice and criticism, showing this anger through aggressive and passive-aggressive behaviors, and impulsivity were the discriminating variables.

The discriminant function analysis results also show that 88% of the participants were classified correctly, the high risk group 87.3%, the low risk group 90.2%.

II. Demographic Variables

In order to investigate how the scores changed according to demographic variables, a 2 (gender) $\times$ 2 (age) $\times$ 3 (SES) ANOVA was conducted for each independent variable. Age was grouped as 14-17 years ($n = 1229$) and 18-25 years ($n = 1047$), while SES was grouped as low, middle, and high. The analyses revealed that gender had a main effect on SAS scores [$F(1, 1781) = 15.71$, $P < 0.05$], BSI [$F(1, 1598) = 15.56$, $P < 0.05$], anger-related situations [$F(1, 1766) = 54.16$, $P < 0.001$], anger-related behaviors [$F(1, 2035) = 36.93$, $P < 0.001$], and impulsive behaviors [$F(1, 2039) = 22.07$, $P < 0.05$]. Females had higher BSI (females: $x = 55.92 \pm 34.60$; males: $x = 49.26 \pm 32.60$) and anger-related situations scores, (females: $x = 165.62 \pm 20.74$, males: $x = 157.03 \pm 24.43$), whereas males had higher SPS (females: $x = 71.80 \pm 12.07$, males: $x = 74.58 \pm 12.20$), anger-related behaviors (females: $x = 43.04 \pm 9.63$, males: $x = 46.09 \pm 10.58$), and MMPI Impulsive Behaviors subscale scores (females: $x = 9.14 \pm 4.00$, males: $x = 10.08 \pm 3.94$). In addition, a significant main effect of age was observed for anger-related situations [$F(1, 1766) = 33.07$, $P < 0.001$], anger-related behaviors [$F(1, 2035) = 49.94$, $P < 0.001$], and interpersonal anger behaviors [$F(1, 1794) = 20.03$, $P < 0.001$] scores. On all 3 scales the 14-17-year-old age group scored higher than the 18-25-year-old age group. The means and standard deviations of the age groups were as follows: Anger-related events scale [14-17 years: $x = 165.20 \pm 22.10$; 18-25 years: $x = 158.71 \pm 22.99$]; interpersonal anger scale [14-17 years: $x = 134.50 \pm 31.22$; 18-25 years: $x = 128.48 \pm 25.27$]; anger-related behaviors [14-17 years: $x = 45.97 \pm 10.72$; 18-25 years: $x = 42.55 \pm 9.18$].

The results also show that SES had a main effect on SPS [$F(2, 1781) = 6.92$, $P < 0.01$], anger-related situations [$F(2, 1766) = 6.76$, $P < 0.01$], and impulsive behaviors scores [$F(2, 2039) = 13.51$, $P < 0.001$]. Post-hoc Tukey's test results are given in Table 4.

Table 4 shows that the low SES group had higher

TABLE 4. Post-hoc Tukey's test results.

	Low SES n = 842		Middle SES n = 932		High SES n = 381		F
	x	ss	x	ss	x	ss	
Suicide Probability Scale (total score)	74.34a	12.38	72.25b	12.16	71.64b	11.60	6.92*
Anger-related situations (total score)	164.41b	22.97	161.83b	22.53	157.36a	22.25	6.76*
Impulsivity	8.96a	3.92	9.84b	4.02	10.08b	3.98	13.51**

Note: There are no significant differences between the means with the same subscript letters.

* $P < 0.01$ ** $P < 0.001$

SPS and impulsive behaviors scores than the middle and high SES groups did. On the anger-related situations scale, the low SES group, again scored higher than the high SES group, while the middle SES group also scored higher than the high SES group

DISCUSSION

The main purpose of the present study was to investigate the validity of a model proposed by Batıgün and Şahin (2003). The analyses reveal that the model's power to accurately predict the high-risk group for suicide was 43%, while it accurately predicted 56.7% of the low risk group. The false prediction rate was 0% (0% false-positives and 0% false-negatives). Based on these findings the researchers think that the model has satisfactory explanatory power.

Discriminant analysis also indicated that, in terms of problem-solving skills, the most important styles to be considered for suicide probability are avoidant and non-confident styles. On the other hand, in terms of anger, the most important variables were feeling intense anger in situations involving injustice and criticism, behaving aggressively and passive-aggressively, and internalizing anger in interpersonal situations. When these behavioral styles or personality characteristics combine with impulsivity, young people should be given extra attention for suicide risk. The results of discriminative analysis, indicating that these variables accurately discriminated 87.3% of those in the high suicide probability group and 90.2% of the low suicide probability group, are worthy of serious consideration.

To summarize, this model can be used for preventive mental health purposes to identify those at risk for suicide and offer them help. In the present study the number of students with a high-risk of suicide was 29 (1.24%) (for ethical purposes the researchers tried to contact some of these students that had written their name and e-mail address on the test forms). According to the Turkish Statistics Department, during the 2005-2006 academic year the number of high school and university students studying in Ankara was 157,315 and 149,107, respectively (www.tuik.gov.tr). Based on these numbers there were 3796 adolescents with a high risk for suicide in Ankara, which is quite high.

As a result, the researchers think that this model could be used by the Turkish Ministry of Education and university counseling centers for identifying those adolescents at risk and offer them help. The findings can also be used in planning preventive measures. It was

observed that the most important variables for suicide risk were avoidant and non-confident problem-solving styles, feeling intense anger in situations involving injustice and criticism, and showing this anger by acting aggressively and passive-aggressively, internalizing this anger in interpersonal contexts, and acting impulsively. These variables taken together indicate the importance of anger-management, problem-solving, and interpersonal communication skills training for youths.

The other study findings are related to the results of ANOVA regarding the demographic variables. This analysis revealed that the males score considerably higher than the females on SPS. The related literature contains contradictory findings in terms of gender and suicide. These differences might be related to study variables, such as suicide attempts or suicide ideation/probability. In terms of suicide probability, some studies indicate that females have a higher probability (Uçar, 1999; He and Lester, 2001), whereas others report there is no difference (Kjoller and Helveg-Larsen, 2000). In the present study males had higher scores. There are 2 other studies that were conducted in Turkey that show males had a higher suicide probability (Tüzün, 1997; Batıgün, 2005). This inconsistency in the findings might be related to another intervening variable other than gender. For example, a study conducted by the present study's second author showed that males use a more "poisoning" interpersonal style than females and that they have higher hopelessness scores and fewer reasons for living (Batıgün, 2008).

A similar situation is true for impulsivity (Williams et al., 1980). Again, in order to understand the reasons for these inconsistent findings, it would be helpful to take other intervening variables into consideration. On the other hand, the present study's findings regarding gender and anger are more in tune with the related literature (Balkaya and Şahin, 2003; Batıgün and Şahin, 2003; Pompili et al., 2007). According to Lester (1997), due to many cultural norms women tend to repress aggressive behaviors when they feel angry, and primarily verbalize their anger. The same might be true for Turkish females. Even though women are affected to a greater degree by anger-evoking situations, they might not externalize these feelings due to shame and fear of social rejection.

The 14-24-year-old age group, in particular, is considered to be at risk for suicide, suicide attempts, and suicidal ideation (Kjoller and Helweg-Larsen, 2000). The sample in the present study consisted mainly of students in this age group. The students aged 14-17 years (ado-

lescents) and those aged 18-25 years (late adolescents) had different anger scale scores; those in the 14-17-year-old age group had higher anger scores. There are similar findings reported in other studies (Cairns et al., 1989; Balkaya and Şahin, 2003; Batıgün and Utku, 2006). As people age, anger-related situations and reactions seem to decrease (Cummings and Ballard, 1991).

It is noteworthy that the students in the low SES group had higher scores, in terms of suicide probability, impulsivity, and anger-related situations. In the related literature SES is considered to be an especially important variable for suicide attempts (Beautrais et al., 1998; Ercan, et al., 2000).

No studies were found that indicate a relationship between anger and SES, other than a study conducted in Turkey that reported individuals with high SES individuals engage in more revengeful and aggressive behaviors (Batıgün and Utku, 2006). This finding is not in agreement with the findings of the present study. It is possible that this difference is related to the different methods of conceptualizing SES. In the Batıgün and Utku (2006) study SES was defined according to monthly family income, whereas in the present study it was defined according to the mother's level of education. No comparable studies of the relationship between SES and impulsive behaviors were found in the literature.

The major limitation of the present study is the use

of SPS scores as the only validity criteria for the model. There are several studies that indicate the scale has high correlations with other indicators of suicide, and that it is a reliable and a valid measure of suicide probability. Nonetheless, in order to further test the validity of the proposed model, within ethical guidelines, it would be necessary to conduct similar studies using other indicators of suicide, such as hopelessness and depression scores. It would also be interesting to study individuals that had attempted suicide and their performance on measures of anger, problem solving, and impulsivity. There are other limitations of the present study. One is related to the sample. The assessment instruments could only be administered to high school students whose teachers gave permission to use their class hour; therefore, the number of students that participated differed from school to school. The same was true for the university students. In addition, due to ethical considerations, no questions were asked regarding previous suicidal behavior by the students and their family members, which could have been used as validity criteria. All the participants were from the Ankara region, and mother's level of education level was the only indicator of SES.

In conclusion, the researchers think that the model has satisfactory validity and that it can be used in high school and university counseling centers as a practical method to identify students at risk for suicide and help them through the implementation of preventive programs.

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