A Pilot Study on Differences in Aggression in New York City and Madrid, Spain, and Their Possible Impact on Suicidal Behavior

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Objective: Published results from a U.S. study of depressed suicide attempters and a Madrid, Spain, study including all consecutively admitted suicide attempters suggested that aggression scores were higher in U.S. attempters. This observation led us to compare depressed attempters and controls from both suicide research centers and explore whether New York City (NYC) patients carry out suicidal acts of greater lethality than patients in Madrid. The study goals were (1) to compare aggression scores in attempters and healthy volunteers between the 2 cities and (2) to determine whether higher aggression scores are associated with greater medical lethality of suicide attempts.

Method: The respective samples from NYC and Madrid included attempters with a DSM-IV diagnosis of major depressive disorder (N = 117 and N = 133) and healthy controls (N = 90 and N = 317). Aggression scores, measured by the Brown-Goodwin Scale, in attempters and healthy volunteers from both sites were compared using an analysis of variance model. The relationship between lethality of suicidal acts and aggression scores in attempters was assessed using logistic regression analyses. NYC subjects were recruited from 1998 to 2001, and Madrid subjects were selected from consecutive admissions in 1999.

Results: Depressed suicide attempters from NYC made attempts of greater lethality and reported more lifetime aggressive behavior than depressed attempters in Madrid. NYC healthy volunteers also reported more aggression than their Madrid counterparts.

Conclusions: This pilot study suggests that the greater lethality of suicidal behavior in NYC compared to Madrid is related to higher aggression levels, although the data have limitations. Cross-cultural studies are needed to verify whether aggression and higher lethality suicide attempts share a common diathesis explaining the higher suicide rates in NYC.

(J Clin Psychiatry 2006;67:375–380)

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The Madrid study was supported by 2 Young Investigator Awards from the National Alliance for Research on Schizophrenia and Depression (NARSAD), Great Neck, N.Y., to Dr. Baca-García, and the U.S. study was supported by grant MH62185 from the National Institute of Mental Health, Bethesda, Md., to Dr. Mann.

Dr. Baca-García lectured once supported by Sanofi-Synthelabo. The other authors report no additional financial or other affiliation relevant to the subject of this article.

Dianne Currier, Ph.D., (New York State Psychiatric Institute/ Columbia University, New York) critically reviewed early versions of the manuscript.

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Aggression is a core dimension of suicidal behavior and has been suggested to contribute to the likelihood of suicide attempts as well as to their lethality.[1] Impulsivity is another core dimension of suicidal behavior.[1] Impulsive personality traits have been related to the likelihood of suicide attempts and are considered a potential treatment target to reduce impulsive suicide attempts in borderline personality disorder patients.[2] Aggression and impulsivity may share some biological mechanisms. Impulsivity appears to be consistently associated with decreased activity in the serotonergic system.[3] Impulsive aggression, or history of aggressive behavior, may be even more closely related to low serotonergic function than impulsivity alone.[3,4]

A comparison[5] using 95% confidence intervals (CIs) of a U.S. study combining Pittsburgh, Pa., and New York City (NYC) samples of depressed suicide attempters[1] and a Madrid, Spain, study[5] including all consecutively admitted suicide attempters (depressed and other patients) revealed that aggression scores appeared higher in the United States, while impulsivity trait scores were similar in both samples. This observation led us to compare depressed attempters and controls from suicide research centers in NYC and Madrid and explore whether, in concordance with the higher rates of completed suicide in

NYC, NYC patients carry out suicidal acts of greater lethality than patients in Madrid. The 2 goals of this study were (1) to compare aggression scores in attempters and healthy volunteers between the 2 cities and (2) to determine whether higher aggression scores are associated with greater medical lethality of suicide attempts.

METHOD

In NYC, suicide attempters (N = 117) were recruited from a population of depressed patients admitted to a university psychiatric hospital from 1998 to 2001. In Madrid, depressed suicide attempters (N = 133) were selected from consecutive admissions to the emergency department of a university hospital in 1999. Approximately two thirds of the Madrid sample (64%, 86/133) were hospitalized or had prior psychiatric hospitalizations. In Spain, the government provides free health services. This university hospital covers a catchment area of approximately 500,000 in northern Madrid; its emergency department covers all medical emergencies in this area. Moreover, there are no psychiatric hospitals in the area, so this hospital's psychiatric unit covers all suicide attempts that receive medical attention.

Healthy volunteers were free of psychiatric disorders and were recruited by advertisement in NYC (N = 90) and from hospital blood donors in Madrid (N = 317).[5] After a complete description of the study, written informed consent approved by the respective institutional review board was obtained. For sample demographic characteristics, see Table 1.

In Madrid, the raters were psychiatrists. In NYC, the raters were master's- or Ph.D.-level psychologists or nurses. DSM-IV diagnoses of major depressive disorder were based on the Structured Clinical Interview for DSM-IV[6] in NYC and on the Mini-International Neuropsychiatric Interview, version 4.4,[7] in Madrid. Other assessment instruments were the same in Madrid and NYC.[1,5] Aggression history was rated using the Brown-Goodwin Scale (BGS),[8] which is a lifetime measure of aggressive acts with 10 items and possible range for the total score of 10 to 40 (the suicide item was excluded from the score). Impulsivity was rated on the Barratt Impulsiveness Scale (BIS),[9] a measure of impulsive personality traits. The version used has 30 items and a possible range for the total score of 0 to 120.[1] Medical lethality or damage resulting from suicide attempts was rated using the Beck Lethality Rating Scale.[10] The Beck Suicidal Intent Scale (SIS)[11] was used to assess the suicidal intent associated with the patient's most lethal attempt.[12,13] It has 15 items, each scored 0 to 2.[11]

Statistical Analyses

The Statistical Package for the Social Sciences (SPSS) was used for statistical analyses.[14] Demographic and clinical characteristics of attempters in Madrid and NYC were compared using t tests, Fisher exact test, χ^2 statistics, and odds ratios (ORs) as appropriate. To assess the relationship of aggression and impulsive traits to clinical and demographic variables, analysis of variance (ANOVA) models were built with aggression and impulsive traits as the dependent variables and site, sex, suicide attempt status, and suicide attempt status–by-site interaction as independent variables.

To further explore the relationship of impulsive traits and aggression to lethality of attempts, the 2 former variables were dichotomized using cut points generated with receiver operating curves (ROC)[15] (Table 1). A dichotomous classification parallels the clinical approach, in which physicians tend to classify continuous behaviors as being normal or abnormal.

Lethality, dichotomized by median split, served as the dependent variable in cross-tabulation analyses that provided univariate ORs. The independent, dichotomous variables were aggression, impulsive traits, city, and alcohol or drug use. To explore the relationships among all of these variables, logistic regression models with lethality as the dependent variable were utilized.

RESULTS

Sample Description

Madrid and NYC attempters did not differ on demographic characteristics (Table 1). NYC healthy volunteers were more aggressive than the Madrid sample (Table 1), but had similar impulsivity scores. Moreover, NYC attempters were more likely to abuse alcohol or drugs compared to Madrid attempters. Similar to NYC healthy volunteers, NYC attempters had higher aggression scores (Figure 1) and similar impulsivity scores compared to Madrid attempters (Figure 2). Despite the use of similar methods to attempt suicide, NYC attempters made more lethal and more frequent attempts.

Comparison of Aggression in Madrid and NYC in Attempters and Controls After Correcting for Other Variables

An ANOVA model including both attempters and healthy volunteers, with the mean aggression score as the dependent variable ($F = 82.7$, $df = 7$, $p < .0001$), showed that site ($F = 165.5$, $df = 1$, $p < .0001$), gender ($F = 31.5$, $df = 1$, $p < .0001$), suicide attempt status ($F = 255.8$, $df = 1$, $p < .0001$), and suicide attempt status–by-site interaction ($F = 4.2$, $df = 1$, $p = .04$) all had an effect on aggression scores. In other words, NYC subjects had higher aggression scores than Madrid subjects. At both sites, males had higher aggression scores than females. The suicide attempters at each site had higher aggression scores than the healthy volunteers. Finally, attempters in NYC scored higher on the aggression measure than attempters

Table 1. Comparison of Clinical Variables in New York City (NYC) and Madrid, Spain, Samples of Patients Who Attempted Suicide and Healthy Volunteers[a]

	Attempters			Healthy Volunteers		
Variable	NYC (N = 117)[b]	Madrid (N = 133)[b]	p	NYC (N = 90)[b]	Madrid (N = 317)[b]	p
Age, mean (SD), y	35.7 (10.8)	37.9 (15.1)	.19[c]	36.1 (14.7)	34.8 (11.5)	.39[d]
BIS score, mean (SD)	56.1 (17.1)	58.7 (16.1)	.24[e]	35.6 (13.2)	41.3 (13.7)	< .001[f]
BGS score, mean (SD)	18.9 (5.1)	14.4 (4.5)	< .001[g]	13.7 (3.6)	10.5 (1.5)	< .001[h]
Gender						
Male	37 (32)	48 (36)	.50[i]	48 (53)	193 (61)	.23[i]
Female	80 (68)	85 (64)		42 (47)	124 (39)	
Ethnicity						
Spanish Caucasians		133 (100)			317 (100)	
US Caucasians	84 (72)			42 (47)		
US Hispanics	18 (15)			15 (17)		
US African Americans	9 (8)			18 (20)		
US Asians	3 (3)			11 (12)		
US others	3 (3)			4 (4)		
Marital status						
Single	62 (53)	58 (43)	.18[j]	57 (63)	146 (46)	< .001[k]
Married	29 (25)	47 (36)		17 (19)	162 (51)	
Separated/widowed	26 (22)	28 (21)		16 (18)	9 (3)	
Years of education						
≤ 8 years	2 (2)	48 (38)	< .001[l]	0 (0)	79 (25)	< .001[m]
9–12 years	12 (10)	41 (31)		5 (6)	98 (32)	
> 12 years	100 (88)	41 (31)		85 (94)	135 (43)	
Lethality of attempts						
(Beck Lethality Rating Scale)						
0	16 (14)	25 (17)	< .001[n]			
1	17 (15)	42 (32)				
2	19 (17)	36 (27)				
3	22 (19)	17 (13)				
4	13 (11)	6 (5)				
5	10 (9)	5 (4)				
6	7 (6)	2 (2)				
7	10 (9)	0 (0)				
Suicide attempt method						
(some patients had more than 1)						
Sedative drugs	66 (59)	89 (67)				
Other drugs	19 (17)	23 (17)				
Drowning	1 (1)	1 (1)				
Cutting	18 (16)	13 (10)				
Jumping	4 (4)	3 (2)				
Hanging	8 (4)	4 (3)				
Low violence methods	91 (81)	114 (86)	.39[i]			
No. of previous attempts			< .001[o]			
None	1 (1)	57 (45)				
1	45 (39)	33 (26)				
2	21 (18)	9 (7)				
3	24 (21)	6 (5)				
More than 3	24 (21)	22 (17)				
Alcohol abuse			.05[i]			
Yes	23 (20)	14 (11)				
No	94 (80)	119 (89)				
Alcohol with other substance abuse			.42[i]			
Yes	15 (13)	12 (9)				
No	102 (87)	121 (91)				
Other substance abuse (no alcohol)			.49[i]			
Yes	11 (9)	9 (7)				
No	106 (91)	124 (93)				
BGS score[p]			< .04[i]			< .04[i]
Low	21 (19)	41 (31)		61 (71)	255 (82)	
High	88 (81)	90 (69)		25 (30)	57 (18)	
BIS score[q]			.51[i]			.67[i]
Low	25 (24)	31 (23)		237 (75)	59 (72)	
High	79 (76)	102 (77)		79 (25)	23 (28)	

[a]Values expressed as N (%) unless otherwise noted.
[b]Data are missing for some variables; therefore, the total Ns for the variables are less than the total group Ns.
[c]t test = 1.1, df = 247. [d]t test = 0.9, df = 393. [e]t test = 1.2, df = 235. [f]t test = 3.4, df = 395. [g]t test = 7.2, df = 238. [h]t test = 12.4, df = 395.
[i]Fisher exact test. [j]$\chi^2 = 3.5$, df = 2. [k]$\chi^2 = 47.5$, df = 2. [l]$\chi^2 = 82.2$, df = 2. [m]$\chi^2 = 74.4$, df = 2. [n]Mann-Whitney U = 4974. [o]$\chi^2 = 71.4$, df = 4.
[p]The BGS cut points for high values were as follows: New York females, 13.5 (sensitivity = 81% and specificity = 78%); New York males, 15.5 (sensitivity = 77% and specificity = 69%); Madrid females, 9.5 (sensitivity = 98% and specificity = 100%); and Madrid males, 10.5 (sensitivity = 77% and specificity = 77%).
[q]The BIS cut points obtained using receiver operating curves were as follows: New York females, 41.5 (sensitivity = 75% and specificity = 72%); New York males, 44.5 (sensitivity = 79% and specificity = 73%); Madrid females, 46.5 (sensitivity = 75% and specificity = 70%); and Madrid males, 50.5 (sensitivity = 81% and specificity = 78%)
Abbreviations: BGS = Brown-Goodwin Scale, BIS = Barratt Impulsiveness Scale.

Figure 1. Brown-Goodwin Scale Scores for Aggression in New York City (NYC) and Madrid, Spain, Samples

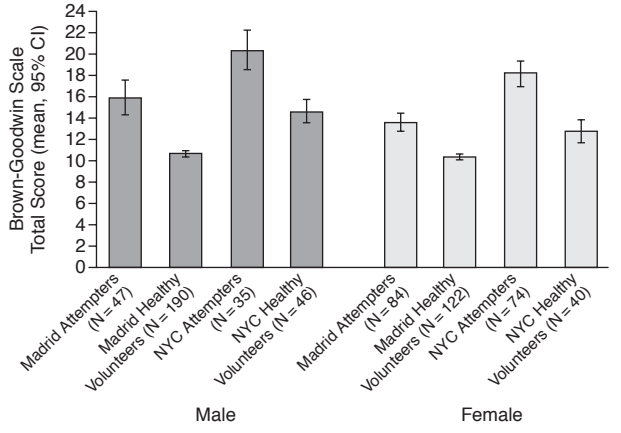
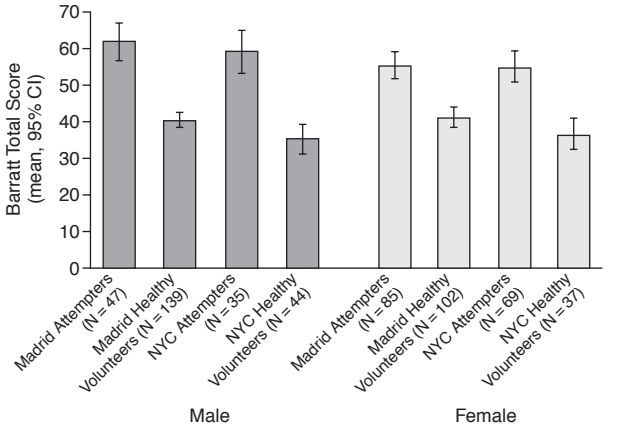


Figure 2. Barratt Impulsiveness Scale Scores in New York City (NYC) and Madrid, Spain, Samples



in Madrid. The same was true for male and female healthy volunteers (Figure 1). Regarding aggression scores, the NYC effect was so remarkable that NYC female attempters had higher mean BGS scores than Madrid male attempters (Figure 1), although this difference was not significant.

Comparison of Impulsive Traits in Madrid and NYC in Attempters and Controls After Correcting for Other Variables

The ANOVA model with impulsivity (mean BIS scores) as the dependent variable was significant ($F = 31.5$, $df = 7$, $p < .0001$) and showed that suicide attempters were more impulsive than controls ($F = 201.7$, $df = 1$, $p < .0001$), as were subjects from Madrid compared to subjects in NYC ($F = 8.8$, $df = 1$, $p < .003$). However, neither sex nor the interactions of independent variables were significant in this model.

Association Between Attempt Lethality and Aggression in Attempters

High attempt lethality was associated with living in NYC (OR = 4.9, CI = 2.9 to 8.6, $p < .001$), aggression (BGS scores) (OR = 1.8, CI = 1.0 to 3.3, $p < .04$), and alcohol use (OR = 1.9, CI = 1.0 to 3.4, $p < .02$).

However, living in NYC was also associated with higher aggression (BGS scores) (OR = 1.9, CI = 1.0 to 3.4, $p < .02$) and alcohol use in attempters (OR = 2.1, CI = 1.0 to 4.3, $p < .03$). To explore potential confounding effects of these independent variables, a logistic regression model with lethality as the dependent variable was developed. Of the significantly different variables identified in univariate analyses (living in NYC, BGS scores, and alcohol use), the only variable that remained significant in the regression analysis was living in NYC. To further explore the association between high lethality and living in NYC, we explored eliminating the effect of higher BGS scores by entering the interaction between living in NYC and BGS scores into the logistic regression model. The OR decreased to 2.2 (CI = 1.0 to 3.4) from 4.9, meaning that the difference, 2.7, reflects the part of the association between attempt lethality and living in NYC that may be explained by the interaction between living in NYC and aggression (BGS scores). This means that the high lethality of suicidal acts in NYC patients may be partly explained by the higher BGS scores of attempters living in NYC, but that there are other factors that also contribute to the higher lethality of attempts observed in NYC patients.

To explore the effects of substance abuse on the association between high lethality and living in NYC, we built 2 logistic regression models with lethality as the dependent variable, one in attempters who used alcohol or other drugs (N = 64) and another in those who did not use alcohol or drugs (N = 186). The association between lethality and living in NYC was high in both groups. The OR was slightly higher in attempters with comorbid substance use (OR = 5.1, CI = 1.6 to 15.9, $p < .005$) than in the attempters with no substance use disorder (OR = 4.4; CI = 2.3 to 8.4, $p < .001$), but not significantly so because the CIs overlapped.

DISCUSSION

Differences in Attempt Lethality Between NYC and Madrid

Cross-tabulation analyses clearly suggested that NYC depressed attempters make more lethal attempts than those studied in Madrid. The higher lethality observed in the NYC sample appeared to be partly explained by the higher BGS scores in NYC attempters, but other unknown factors may also contribute. Our data suggest that the association between lethality and living in NYC cannot be explained

by higher rates of substance use disorder in the NYC sample. NYC depressed attempters with no substance use disorders also had higher lethality scores than their Madrid counterparts.

Differences in Aggression Between NYC and Madrid

Our data support the notion that lifetime aggression is a central dimension of suicidal behavior related to the lethality of attempts. Given the relationship between aggression and lethality, higher rates of suicide in NYC compared to Madrid may be related to greater aggression not only in depressed attempters, but also in the general population. Indeed, we found that NYC healthy volunteers reported more lifetime aggressive acts than those in Madrid, paralleling data documenting higher rates of violent crime in NYC. A more aggressive population may be expected to make more lethal attempts that result in suicide more often than a less aggressive cohort.

As described in the limitations section, our attempter and control samples may not accurately represent attempters and controls from both cities. We reviewed published data to grossly compare aggressive behaviors in each city. While there are no published data on aggression measures in individuals drawn from the general population, reported crime rates in NYC for 1998 were higher than in Madrid for homicide (8.6 vs. 3.2/100,000), assault (1131 vs. 891/100,000), rape (28.7 vs. 24.3/100,000), and crime against property (3224 vs. 2498/100,000).[13,14] In 1998, suicide completion rates were also higher in NYC than in Madrid (7.5 vs. 3.2/100,000).[16,17] The large differences in aggressive behavior found in this study, although somewhat limited by methodological difficulties, may reflect more aggressive behavior in people living in NYC as compared to those in Madrid. If so, NYC's higher suicide rate may be partly explained by this higher level of aggression in the general population, as well as in suicide attempters in NYC. Finally, we hypothesized that transcultural differences might modulate the expression of aggression but not of impulsive traits.

Impulsive Traits and Suicide Attempts

Impulsive traits did not appear to be as crucial a dimension as aggression regarding attempt lethality. BIS scores were slightly higher in the Madrid study sample, but they were not significantly associated with lethality scores. Moreover, if impulsive traits are a major determinant of completed suicides, Madrid should have a higher suicide rate than NYC. Corruble et al.[18] reported a change in impulsivity status in depressed patients after antidepressant treatment and identified the need to study the impact of impulsivity as a state and as a trait in suicidal behavior. We have found that BIS scores are not associated with impulsive attempts, suggesting that impulsive personality traits and impulsive suicide attempts as a state may not be associated.[19] In 2 Madrid samples of suicide attempters, including patients with any psychiatric diagnosis, our analyses confirmed that impulsive attempts, which can happen in both impulsive and nonimpulsive attempters, appeared to be associated with lower attempt lethality.[19,20]

Limitations and Future Studies

Limitations of this comparison include small sample sizes, different recruitment methods for both patients and controls, and that the samples were not specifically collected to test the hypotheses. No interrater reliability was calculated between NYC and Madrid ratings, but Dr. Baca-García rotated and was trained at the NYC site, and many of the instruments[21] used by the NYC team are also used by the Madrid suicide research program. It was not possible to compare depression severity levels in NYC and Madrid, but suicide intent as measured by the SIS was not significantly different between NYC and Madrid samples in either males (respectively, mean ± SD = 17.1 ± 5.8 vs. 15.8 ± 5.2, $t = -1.1$, $df = 82$, $p = .27$) or females (respectively, 15.5 ± 5.6 vs. 14.0 ± 5.4, $t = -1.6$, $df = 158$, $p = .10$). The studied samples may not be representative of the people living in NYC and Madrid. The Madrid attempters are a good representation of the attempters receiving medical attention in northern Madrid, but the NYC attempters and the Madrid and NYC controls may be less representative.

Cross-cultural studies comparing suicide attempters in NYC, Madrid, and other cities are needed to verify the site-independent association of aggression with higher lethality attempts. Methodological improvements advisable for future studies include using the same instruments, the same recruitment methods, bilingual raters, and common training at both sites with interrater reliability assessment conducted using tapes. Obtaining more representative samples may be expensive and difficult to accomplish. Madrid has the advantage of a nationalized public health system with a general hospital providing emergency services for each catchment area, but suicide attempter recruitment will still be hampered by the lack of inclusion of attempters who do not receive medical attention. Due to the lack of medical insurance covering all New Yorkers, and a chaotic and compartmentalized health system that includes all types of hospitals, it is almost impossible to get a representative sample of NYC suicide attempters. Obtaining representative control samples will be possible only by including a measure of aggression in large epidemiologic health surveys. Unfortunately, it may not be easy to convince designers of large health surveys of the benefit of including an aggression scale, particularly in NYC, to document that New Yorkers are characterized by high levels of aggression.

More complex studies should examine the relationship of between-site variance in aggression levels to differences in suicide rates across countries. Verification of our

results would suggest that suicide prevention strategies based on improving identification and treatment of individuals with high-risk diagnoses such as major depressive disorder and decreasing access to lethal suicide means such as firearms need to be augmented. Strategies aimed at decreasing aggressive behavior and violence, such as early childhood home visitation programs, could target a broader cohort and result in lowering violent or aggressive acts in the general population. Such interventions could potentially not only diminish the lethality of suicide attempts when they occur, but also lower suicide completion rates.

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