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Is poor premorbid functioning a risk factor for suicide attempts in first-admission psychosis?

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ABSTRACT

Background: While poor premorbid functioning is associated with poorer outcomes in psychotic illnesses, little is known about whether it is also a risk factor for suicide attempts.
Objective: The current study examined the association of premorbid functioning and suicide attempts in a county-wide cohort of first-admission inpatients.
Method: Data were derived from participants of the Suffolk County Mental Health Project ($n=444$) over the course of 48-month follow-up. Premorbid functioning was estimated and categorized (good vs. poor/declining) using the Premorbid Adjustment Scale (PAS).
Results: Poorer premorbid functioning was significantly associated with increased likelihood of a suicide attempt prior to first psychiatric hospital admission. Specifically, 33.0% of participants with poor/declining premorbid functioning had a history of suicide attempts compared to 23.5% with good premorbid functioning. Among participants with a prior attempt ($n=126$), poor premorbid functioning was significantly associated with an increased likelihood of additional attempts during the four years after first hospitalization.
Conclusion: Identifying those with poor premorbid functioning and prior histories of attempts could help clinicians target high-risk patients. Thus, greater attention to persons with both risk factors may form the basis for early interventions aimed towards reducing the risk for subsequent suicide attempts.

1. Introduction

Good premorbid functioning in schizophrenia and other psychotic disorders is associated with better clinical and functional outcomes in both first episode (Addington and Addington, 2008; Bromet et al., 2005; Jeppesen et al., 2008; Rabinowitz et al., 2002; Rabinowitz et al., 2006) and chronically ill patients (Cannon-Spoor et al., 1982). However, mortality studies have suggested that among persons with schizophrenia, good premorbid functioning increases the risk of completed suicide (Pompili et al., 2008). This is possibly because of "the demoralization syndrome" (Drake and Cotton, 1986) in which those with good premorbid functioning and insight into their illness consider the differences between their premorbid capacities and expectations on the one hand, and their current difficulties in functioning and lower than expected achievements on the other hand. It has been hypothesized that this can lead to a sense of hopelessness and ultimately suicide (Drake et al., 1984, 1985).

In contrast, other mortality studies have found that in early onset schizophrenia patients, poor premorbid functioning is associated with an increased risk of suicide (Modestin, 1986; Modestin et al., 1992; Stephens et al., 1999), possibly reflecting poor coping skills and increased impulsivity (Modestin et al., 1992). What is clear from this body of work is that people with schizophrenia who commit suicide represent a heterogeneous group with respect to their early backgrounds. Conceivably, differences in sample characteristics,

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especially age of onset, have contributed to the contradictory findings to date.

However, not all individuals who commit suicide will have made prior attempts and not all suicide attempters go on to complete suicide. Yet similar to the mortality research, the findings on the relationship of premorbid functioning with suicide attempts have been mixed. Some studies have found that among persons with psychotic illnesses, though not specifically schizophrenia, good premorbid functioning is associated with a lower risk for suicide attempts (Goldberg and Ernst, 2004; Muller et al., 2005; Robinson et al., 2009). Yet others have found no association between premorbid functioning and suicide attempts in chronic schizophrenia (Gupta et al., 1998; Restifo et al., 2009). However, empirical data on premorbid functioning and suicide attempts in psychosis are relatively scarce. Thus, the association of premorbid functioning and suicide attempts remains unclear.

Previous studies examining the association of premorbid functioning and suicide attempts used retrospective designs (Goldberg and Ernst, 2004; Muller et al., 2005), were based on medical records (Robinson et al., 2009), sampled consecutive hospital admissions, concentrated on chronically ill patients, and focused on lifetime suicide behaviors (Goldberg and Ernst, 2004; Gupta et al., 1998; Muller et al., 2005; Restifo et al., 2009).

In the present study, we examined the association of premorbid functioning to suicide attempts in a multi-site cohort of first-admission patients with psychotic disorders using a longitudinal design. Specifically, we examined whether in a first-admission sample, poor premorbid functioning was associated with a history of a suicide attempt prior to the first hospital admission and whether poor premorbid functioning was associated with subsequent suicide attempts during the 48-month follow-up period among those with and without a prior history of attempts.

2. Materials and methods

2.1. Sample and procedures

Details about the design of the Suffolk County Mental Health Project (SCMHP) can be found elsewhere (Bromet et al., 1996, 2005). Briefly, first-admission patients ages 15–60 who were residents of Suffolk County, New York (population 1.3 million) and who presented with psychotic symptoms were recruited by the chief nurse, social worker or project staff from 12 inpatient facilities between September 1989 and December 1995 (baseline response rate = 72%). The procedures for obtaining written informed consent were approved annually by the Committees on Research Involving Human Subjects at Stony Brook University and by the Institutional Review Boards of the hospitals where respondents were recruited. Written informed consent to all study procedures was obtained from respondents and from parents of respondents under the age of 18. Signed releases for hospital and clinical records were obtained at each face-to-face follow-up assessment although this was not a requirement for participation. Initial interviews occurred primarily in the hospital. Follow-up interviews took place in participants' homes at 6-, 24-, and 48-month follow-up.

2.2. Premorbid variables

The Premorbid Adjustment Scale (PAS) (Cannon-Spoor et al., 1982) is a 28-item rating scale which assesses sociability and withdrawal, peer relationships, adaptation to school, and scholastic performance during four life stages: childhood (11 years and younger); early adolescence (12–15 years); late adolescence (16–18 years); and young adulthood and adulthood (>18 years). The PAS is only scored for life phases up to the age of onset; thus, for example, a person with onset of psychosis at the age of 16 was only scored for the first two life stages. The PAS is a dimensional scale that is scored by computing the average for each life stage and a total score for all premorbid life stages, with higher scores indicating poorer functioning. In this study, the ratings were based on a semi-structured interview developed to match the PAS criteria which was administered to respondents during the 6-month follow-up assessment.

For typology of premorbid functioning, similar to other recent studies (Rabinowitz et al., 2002, 2006), the Haas and Sweeney (1992) method was used to classify participants into "stable-good" ($n = 217$), "stable-poor" ($n = 197$), and "deteriorating" premorbid functioning ($n = 30$). Using that method, deteriorating is defined as "a pattern of worsening [PAS] scores from childhood over the remaining premorbid periods and the equivalent of a 2-point change over four premorbid stages (childhood, early adolescence, late adolescence, and adulthood) or a proportionate decline for cases in which illness onset was before late adolescence or adulthood." The remaining cases are regarded as stable. The median value (in the current study 0.29) of the PAS total score is then used as the cut point to divide the stable cases into stable-good (scores less than 0.29) or stable-poor (scores greater than or equal to 0.29) groups. Similar to other studies (Haim et al., 2006) because of the small size of the deteriorating group ($n = 30$), it was combined with the stable-poor group in the present analysis ($n = 227$).

2.3. Suicide attempts and lethality of intent

Suicide attempt was defined as an act of potentially self-injurious behavior inflicted with at least some intent to die. Lifetime suicide attempts were determined from multiple sources, including the depression module of the Schedule for Clinical Diagnosis III-R version (SCID) (Spitzer et al., 1992) supplemented by questions assessing severity of suicide ideation and attempts, the suicide item in the Hamilton Depression Rating Scale (Hamilton, 1960), and the reason for admission recorded in the medical record. By combining self reports, rating scale data, and reason for hospitalization, we were able to improve the reliability of our determination of suicide behavior. Suicide attempts during the follow-up period were obtained as part of the 6-, 24-, and 48-month interviews. Follow-up data were available for respondents who had full interviews on at least one of these post baseline time-points.

Lethality of intent was defined as the seriousness or intensity of the participant's wish to terminate his or her life (Beck et al., 1974). Interviewers determined the circumstances and seriousness of intent (for most serious attempt) by considering factors such as lethality of method, likelihood

of being rescued, degree of planning, and purpose of attempt (Spitzer et al., 1992). For the analysis, lethality of intent was dichotomized into "low intent" (no intent, minimal intent, and ambivalent intent) vs. "high intent" (serious intent, very serious intent, and extremely serious intent) categories.

2.4. Diagnosis

A team of psychiatrists formulated the DSM-IV study diagnosis at consensus conferences held after the 6- and 24-month assessments using all available sources of information (Schwartz et al., 2000). The 24-month diagnosis was used to define the diagnostic groups; the 6-month diagnosis was used when the 24-month variable was missing.

Of the 675 participants admitted to the study, 628 were confirmed to have a psychotic diagnosis at the 24-month follow-up, and 444 (70.7%) of them had complete information on premorbid functioning, history of lifetime suicide attempts (as assessed at baseline), and suicide attempts at one or more time-points during the follow-up. Participants included in this report ($n=444$) were significantly younger ($p<0.01$) than those who were not included ($n=184$). No significant differences were found with respect to any of the other variables included in this report.

This paper focuses on 176 respondents with schizophrenia spectrum disorders (143 with schizophrenia, 26 with schizoaffective disorder, and 7 with schizophreniform disorder) and 268 with other psychoses (112 with bipolar disorder with psychotic features, 83 with major depression with psychotic features, 38 with other psychotic illnesses, and 35 with drug-induced disorders). Thus, 39.6% ($n=176$) of the sample was classified within the schizophrenia spectrum and 60.4% ($n=268$) was categorized into the non-schizophrenia disorder group.

2.5. Statistical analyses

The association of premorbid functioning and suicide attempts prior to first hospital admission was examined with logistic regression. Separate models for each phase were estimated since the PAS is only scored for life phases up to the age of onset. Hence the number of cases in the analysis declined with each successive life stage. Contingency table analyses were first used to examine the association of "good" vs. "poor" premorbid functioning, based on the PAS categorization, with suicide attempt, supplemented by an examination of lethality of intent among attempters.

Cox regression analyses were used to examine whether poor premorbid functioning was associated with suicide attempts during the 48-month follow-up period. Since pre-baseline suicide attempt is the most salient predictor of future attempts (Bakst et al., 2009; Harkavy-Friedman and Nelson, 1997; Hawton et al., 2005; Pompili et al., 2007), suicide risk during follow-up was analyzed separately for participants with and without prior attempts.

Multivariable logistic regression was also used to adjust for sex, diagnosis, and age at first admission, given evidence from first episode samples that younger age, being male, and the diagnosis of schizophrenia are risk factors for suicide attempts (Robinson et al., 2009). Two additional sets of analyses were performed separately for males and females, and for the broad diagnostic categories (schizophrenia and other psychosis) because these variables differed respectively on the risk factors considered in the analyses (Table 1). Specifically, male participants were more often diagnosed with schizophrenia ($p<0.05$), had a younger age of onset of psychosis ($p<0.001$), and were younger at time of admission ($p<0.01$). Although there were no gender differences in lifetime suicide attempt rates ($p>0.05$), males had greater lethality of intent ($p<0.05$). Most importantly for this report, male respondents presented with higher (worse) scores on each of the PAS life stages (in descending order): early/late adulthood ($p<0.001$), later adolescence ($p<0.001$), childhood ($p<0.01$), early adolescence ($p<0.05$), and more of the male participants had a deteriorating/poor premorbid course ($p<0.01$).

Similarly, those with a schizophrenia diagnosis were significantly younger at onset of psychosis ($p<0.001$) and time of admission ($p<0.01$), but there were no diagnosis-specific findings for lifetime suicide attempts ($p>0.05$) or lethality of intent ($p>0.05$). Most importantly, participants with schizophrenia had higher PAS scores (in descending order): during childhood ($p<0.001$), early adolescence ($p<0.001$), later adolescence ($p<0.001$), early/late adulthood ($p<0.001$), and relatively more participants with schizophrenia had a deteriorating/poor premorbid course ($p<0.001$; Table 1). All analyses were conducted using SPSS (version 15.0).

3. Results

3.1. Premorbid functioning and suicide attempts prior to first admission

Table 2 shows that participants who made a suicide attempt prior to admission had poorer premorbid functioning at each life stage except adulthood. As shown in Table 3, having poor vs. good premorbid functioning was associated with a 1.60 (95% CI, 1.05–2.44, $p=0.03$) increased risk of suicide attempts by the time of first admission. Of those with poor premorbid functioning, 33.0% ($n=75/227$) made a suicide attempt prior to first admission as compared to 23.5% ($n=51/217$) in the good premorbid group. At the time of first admission, having poor (24.3%, $n=17/70$) compared with having good premorbid functioning (28.6%, $n=14/49$) was not associated with lethality of attempt among attempters ($p=0.60$).

Analysis separately performed for male and female respondents with respect to suicide attempt histories revealed a similar pattern of results although with reduced power, many of the effects were non-significant (tables available from corresponding author).

Separate analysis conducted for the 2 broad diagnostic groups found that premorbid functioning was significantly associated with suicide attempt history in the other psychosis group (in descending order: total score $p<0.001$, child $p<0.01$, early $p<0.01$, late $p<0.01$, good vs. poor/declining $p<0.01$, adult $p<0.05$) but not in the schizophrenia group (tables available from corresponding author).

3.2. Premorbid functioning and suicide attempts during follow-up

Table 2 shows that worse premorbid functioning (i.e., higher PAS scores) at the younger and older stages and the

Table 1
Demographic and clinical characteristics.

	All Subjects	Sex			Diagnosis		
	Total ($n=444$)	Male ($n=265$)	Female ($n=179$)	p value	Schizophrenia ($n=176$)	Other ($n=268$)	p value
Onset features							
Age at admission (mean ± S.D.) [a]	29.03 ± 9.37 ($n=444$)	28.0 ± 9.23 ($n=265$)	30.6 ± 9.38 ($n=179$)	0.004**	27.15 ± 8.03 ($n=176$)	30.26 ± 9.97 ($n=268$)	0.001**
Age of onset of psychosis (mean ± S.D.)	27.76 ± 9.12 ($n=437$)	26.6 ± 8.73 ($n=260$)	29.3 ± 9.48 ($n=177$)	0.003**	24.94 ± 6.98 ($n=175$)	29.64 ± 9.88 ($n=262$)	0.000***
Diagnosis: schizophrenia (%)	39.6% ($n=176$)	67.0% ($n=118$)	33.0% ($n=58$)	0.01*	–	–	–
Suicide attempt features							
Lifetime suicide attempt: yes (%) [b]	28.4% ($n=126$)	54.8% ($n=69$)	45.2% ($n=57$)	0.18	37.3% ($n=47$)	62.7% ($n=79$)	0.52
Lethality of suicide attempt: high (%)	7.0% ($n=31$) [c]	67.7% ($n=21$)	32.3% ($n=10$)	0.04*	29.0% ($n=9$)	71.0% ($n=22$)	0.28
Premorbid features [d]							
Childhood (mean ± S.D.)	0.29 ± 0.16 ($n=444$)	0.30 ± 0.17 ($n=265$)	0.26 ± 0.16 ($n=179$)	0.009**	0.32 ± 0.17 ($n=176$)	0.27 ± 0.16 ($n=268$)	0.000***
Early adolescence (mean ± S.D.)	0.30 ± 0.17 ($n=434$)	0.32 ± 0.17 ($n=259$)	0.28 ± 0.17 ($n=175$)	0.02*	0.35 ± 0.18 ($n=175$)	0.28 ± 0.16 ($n=259$)	0.000***
Later adolescence (mean ± S.D.)	0.33 ± 0.18 ($n=409$)	0.37 ± 0.20 ($n=245$)	0.29 ± 0.16 ($n=164$)	0.000***	0.40 ± 0.19 ($n=162$)	0.30 ± 0.17 ($n=247$)	0.000***
Early/late adulthood (mean ± S.D.)	0.21 ± 0.14 ($n=292$)	0.24 ± 0.15 ($n=171$)	0.18 ± 0.12 ($n=121$)	0.000***	0.28 ± 0.14 ($n=145$)	0.15 ± 0.11 ($n=147$)	0.000***
PAS: deteriorating/poor premorbid course (%)	51.1% ($n=227$)	67.4% ($n=153$)	32.6% ($n=74$)	0.001**	64.8% ($n=114$)	42.2% ($n=113$)	0.000***

Note. *$p<0.05$, **$p<0.01$, ***$p<0.001$.
[a] Supplementary analysis revealed that those with a deteriorating/poor premorbid course were younger at time of admission (27.3 ± 8.95, $n=227$ vs. 31.0 ± 9.50, $n=217$; $p=0.000$).
[b] Lifetime suicide attempts were assessed at the time of admission. Suicide attempts during follow-up (among those with prior histories) did not differ with respect to sex ($p=0.53$) or diagnostic category ($p=0.33$).
[c] Information on lethality of attempt, as assessed at baseline, was missing for 9.4% (total $n=119/126$) of those with lifetime histories of suicide attempts.
[d] Higher premorbid mean scores indicate worse functioning.

total score significantly increased the likelihood of future suicide attempts in the group of previous attempters.

As shown in Table 3, among the 126 respondents with an attempt history prior to first hospital admission, 37 (29.4%) made one or more subsequent attempts during the 48-month follow-up period. Thirty-seven percent (28/75) of those with poor premorbid functioning made a subsequent attempt compared to 17.6% (9/51) having good premorbid functioning (OR = 2.78, CI = 1.17–6.56, $p=0.02$). In the analyses of lethality of intent among follow-up attempters, no significant differences in premorbid functioning were detected by 6-month ($n=120/126$; $p=0.96$), 24-month ($n=120/126$; $p=0.70$), or 48-month ($n=121/126$; $p=0.93$) follow-up.

Among the 318 respondents who did not attempt suicide prior to first hospital admission, only 22 (6.9%) made one or more attempts during the 48-month follow-up. Seven percent ($n=11/152$) with poor premorbid adjustment made an attempt during the follow-up compared to 6.6% ($n=11/166$) with good premorbid adjustment (OR = 1.03, CI = 0.43–2.44, $p=0.94$). As expected, given the minimal power of these analyses, none of the premorbid functioning variables was associated with subsequent suicide attempts.

Separate analyses of the association of premorbid functioning and suicide attempts during following up were conducted by sex and diagnostic group. Given the limited power we regarded differences of $p<0.10$ as being of interest. Both of these sub-analyses revealed a similar pattern of results as presented for the entire sample, with the exception that among women there was an association of suicide attempts and being in the poor premorbid category ($p<0.02$), and a worse PAS total score ($p<0.04$) among attempters (tables available from corresponding author). Analyses restricted to respondents without a history of attempts before index hospitalization could not be conducted by the 48-month follow-up period, due to the small number of available cases when stratifying by sex (female attempters, $n=10$, male attempters, $n=12$), and diagnosis (attempters with schizophrenia, $n=9$, other psychosis, $n=13$).

4. Discussion

In the current study, we found a strong association between poor premorbid functioning and greater risk for suicide attempts in a large county-wide sample of first-admission patients with psychosis. To our knowledge, this study represents the first to examine both the retrospective associations prior to admission and the longitudinal associations over a four-year follow-up in a multi-facility based, first-admission cohort adjusting for sex and diagnosis. Although others have made efforts to study premorbid functioning and suicide attempts separately for males and females (Muller et al., 2005; Thorup et al., 2007), they concentrated solely on persons with lifetime attempt histories. Similarly, while a few studies have also examined these associations in samples

Table 2
Association of Premorbid Adjustment Scale (PAS) dimensional scores and suicide attempts.[a]

		Statistic	Child (age 11 and under)	Early (age 12 to 15)	Late (age 16 to 18)	Adult (age 18 and above)	Total
Suicide attempts prior to first admission							
Lifetime — baseline	Yes	Mean (SD), *n*	0.33 (0.17), *n* = 126	0.34 (0.18), *n* = 120	0.38 (0.19), *n* = 109	0.23 (0.14), *n* = 79	0.33 (0.15), *n* = 126
	No	Mean (SD), *n*	0.28 (0.17), *n* = 318	0.30 (0.17), *n* = 314	0.32 (0.19), *n* = 300	0.20 (0.14), *n* = 213	0.28 (0.15), *n* = 318
Logistic regression [b]		OR; 95% CI	5.82; 1.69–20.06	4.19; 1.23–14.23	4.08; 1.24–13.40	3.48; 0.54–22.43	7.35; 1.80–29.93
		p, *n*	*p* = 0.003**, *n* = 444/444	*p* = 0.02*, *n* = 434/444	*p* = 0.02*, *n* = 409/444	*p* = 0.11, *n* = 292/444	*p* = 0.003**, *n* = 444/444
Suicide attempts after first admission among subjects with attempts before first admission							
0–6 months	Yes	Mean (SD), *n*	0.33 (0.18), *n* = 24	0.39 (0.20), *n* = 20	0.47 (0.16), *n* = 16	0.25 (0.11), *n* = 12	0.36 (0.13), *n* = 24
	No	Mean (SD), *n*	0.33 (0.17), *n* = 101	0.33 (0.17), *n* = 99	0.35 (0.19), *n* = 93	0.23 (0.14), *n* = 66	0.32 (0.15), *n* = 101
Cox regression [c]		HR; 95% CI	1.08; 0.08–11.20	3.99; 0.40–39.55	24.54; 1.09–549.048	4.10; 0.05–285.62	4.62; 0.27–78.51
		p, *n*	*p* = 0.94, *n* = 24/125	*p* = 0.31, *n* = 20/119	*p* = 0.03*, *n* = 16/109	*p* = 0.51, *n* = 12/78	*p* = 0.25, *n* = 24/125
0–24 months	Yes	Mean (SD), *n*	0.34 (0.19), *n* = 32	0.40 (0.19), *n* = 28	0.44 (0.17), *n* = 24	0.25 (0.10), *n* = 18	0.36 (0.13), *n* = 32
	No	Mean (SD), *n*	0.32 (0.17) *n* = 94	0.32 (0.17), *n* = 32	0.35 (0.19), *n* = 85	0.22 (0.15), *n* = 61	0.31 (0.15), *n* = 94
Cox regression [d]		HR; 95% CI	1.59; 0.20–12.41	5.63; 0.81–38.79	12.42; 1.05–145.95	4.68; 0.14–146.94	5.44; 0.59–61.73
		p, *n*	*p* = 0.62, *n* = 32/126	*p* = 0.07$,*n* = 28/120	*p* = 0.03*, *n* = 24/109	*p* = 0.27, *n* = 18/79	*p* = 0.08$, *n* = 32/126
0–48 months	Yes	Mean (SD), *n*	0.36 (0.19), *n* = 37	0.40 (0.19), *n* = 33	0.46 (0.17), *n* = 28	0.27 (0.10), *n* = 21	0.38 (0.14), *n* = 37
	No	Mean (SD), *n*	0.31 (0.16), *n* = 89	0.31 (0.17), *n* = 87	0.34 (0.18), *n* = 81	0.21 (0.14), *n* = 58	0.30 (0.14), *n* = 89
Cox regression [e]		HR; 95% CI	2.57; 0.39–17.06	6.17; 0.99–38.56	15.77; 1.69–147.17	6.53; 0.28–148.48	9.26; 1.00–85.02
		p, *n*	*p* = 0.32, *n* = 37/126	*p* = 0.03*, *n* = 33/120	*p* = 0.008**, *n* = 28/109	*p* = 0.14, *n* = 21/79	*p* = 0.02*, *n* = 37/126

Note. OR = odds ratio; HR = hazard ratio; CI = confidence interval.
*$p<0.05$, **$p<0.01$, $ = approaching significance.
[a] Suicide attempt was coded as Yes = 1 and No = 0; higher premorbid mean scores indicate worse functioning.
[b] Analysis controlled for sex ($p>0.09$), age ($p>0.10$), and diagnosis ($p>0.17$); maximum $n = 444$.
[c] Analysis controlled for sex ($p>0.40$), age ($p>0.10$), and diagnosis ($p>0.34$); maximum $n = 125$ ($n = 1$ missing case).
[d] Analysis controlled for sex ($p>0.50$), age ($p>0.10$), and diagnosis ($p>0.34$); maximum $n = 126$.
[e] Analysis controlled for sex ($p>0.50$), age ($p>0.09$), and diagnosis ($p>0.21$); maximum $n = 126$.

with a mix of diagnoses (Goldberg and Ernst, 2004; Muller et al., 2005; Robinson et al., 2009), no previous study has made direct diagnostic comparisons. Moreover, in considering the association of premorbid functioning with post-hospital suicide attempts, we stratified the sample by their attempt history since the latter is the most powerful explanatory variable.

The findings must be viewed within the context of the limitations of the study. First, we did not have information on age at first suicide attempt, and thus we were not able to determine whether suicide attempts prior to first admission occurred prior to onset of psychosis (i.e., premorbidly). Second, the small number of previous non-attempters who made an attempt during the follow-up (6.9%, $n = 22/318$) reduced our power to examine the predictive effects of premorbid functioning in this group. Similarly, supplementary analyses stratified by sex and by the two broad diagnostic groups were limited by the relatively small number of post baseline attempters in the groups with no history of attempts. Third, the Premorbid Adjustment Scale is a retrospective measure and thus might be weakened by recall bias. The PAS was based to a large extent on self-report with some corroboration from other information sources as were available. However, a recent study (Brill et al., 2008) found only small and non-significant differences between retrospective and contemporaneous ratings of premorbid functioning, thus supporting the value of the PAS based on self-report data.

With these caveats in mind, we found that poor functioning prior to illness onset was associated with suicide attempt history and attempts during the 48-month follow-up among those with attempt histories. This finding is consistent with several prior studies that found an association between poor premorbid functioning and suicide attempts (Goldberg and Ernst, 2004; Muller et al., 2005; Robinson et al., 2009). Nevertheless, other studies have found no association between premorbid functioning and suicide risk (Gupta et al., 1998; Restifo et al., 2009). A possible explanation for this inconsistency might be methodological differences, particularly variability in the clinical characteristics of the samples, socio-economic heterogeneity, and measurement differences in ascertaining suicide behavior or premorbid functioning (Goldberg and Ernst, 2004; Gupta et al., 1998; Muller et al., 2005; Restifo et al., 2009).

In contrast to other research (Pompili et al., 2008; Restifo et al., 2009), we did not find significant associations between premorbid functioning and lethality of intent (among attempters) prior to illness or during the 48-month follow-up. If our results are confirmed in other studies, they would suggest that findings reported for suicide completers do not generalize to suicide attempters with schizophrenia (Drake et al., 1986; Pompili et al., 2008).

Similar to prior studies we found that the association of premorbid functioning and suicide attempts applied to males and females (Muller et al., 2005; Thorup et al., 2007) and occurred not just in schizophrenia but also in patients with other psychotic disorders (Goldberg and Ernst, 2004). Although the smaller sample size during the follow-up limited power, our findings provide a preliminary basis supporting sex-specific and diagnostic-specific approaches to the study of premorbid functioning and suicide behaviors.

Finally, longitudinal prospective study designs are needed to confirm our findings on the relationship of premorbid functioning to both suicide attempts and lethality of

Table 3
Association of premorbid adjustment category and suicide attempts.[a]

	Suicide attempt		Adjusted logistic regression at baseline Cox regression post baseline		
	Yes	No	OR/HR	95% CI	*p* value
Suicide attempts prior to first admission					
Lifetime — baseline					
Poor/declining ($n=227$)	59.5% ($n=75/126$)	47.8% ($n=152/318$)	1.60	1.05–2.44	$p=0.03$*[b]
Good ($n=217$)	40.5% ($n=51/126$)	52.2% ($n=166/318$)			
Suicide attempts after first admission among subjects with attempts before first admission					
0–6 months[c]					
Poor/declining ($n=75$)	75.0% ($n=18/24$)	56.4% ($n=57/101$)	2.31	0.84–6.32	$p=0.09$$[d]
Good ($n=50$)	25.0% ($n=6/24$)	43.6% ($n=44/101$)			
0–24 months					
Poor/declining ($n=74$)	75.0% ($n=24/32$)	54.3% ($n=51/94$)	2.52	1.03–6.20	$p=0.04$*[e]
Good ($n=52$)	25.0% ($n=8/32$)	45.7% ($n=43/94$)			
0–48 months					
Poor/declining ($n=75$)	75.7% ($n=28/37$)	52.8% ($n=47/89$)	2.78	1.17–6.56	$p=0.02$*[f]
Good ($n=51$)	24.3% ($n=9/37$)	47.2% ($n=42/89$)			

Note. OR = odds ratio; HR = hazard ratio; CI = confidence interval.
*$p<0.05$, $ = approaching significance.
[a] Suicide attempt was coded as: Yes = 1, No = 0.
[b] Analysis controlled for sex ($p=0.09$), age ($p=0.20$), and diagnosis ($p=0.24$); total ($n=444/444$).
[c] Missing ($n=1$).
[d] Analysis controlled for sex ($p=0.54$), age ($p=0.23$), and diagnosis ($p=0.54$); number of attempters ($n=24$), censored cases ($n=101$), total ($n=125$), missing ($n=1$).
[e] Analysis controlled for sex ($p=0.63$), age ($p=0.28$), and diagnosis ($p=0.32$); number of attempters ($n=32$), censored cases ($n=94$), total ($n=126$).
[f] Analysis controlled for sex ($p=0.99$), age ($p=0.22$), and diagnosis ($p=0.20$); number of attempters ($n=37$), censored cases ($n=89$), total ($n=126$).

attempts. Future research among first-admission patients, with attention to sex-specific and diagnostic-specific differences, should focus on the high-risk group of previous attempters. Moreover, additional risk factors unexamined in this report, such as insight into the disorder, depression, and hopelessness could have potentially mediated the relationship between premorbid functioning and suicide attempts (Restifo et al., 2009). Consequently, we recommend that future research examine these potential interactions with respect to premorbid functioning, suicide attempts, and lethality of attempts.

4.1. Conclusion

In summary, the current epidemiologically based findings suggest that persons suffering from psychotic illness who had poor premorbid functioning are a very vulnerable group for suicide attempts. Taken together, it is suggested that persons with histories of suicide attempts and poor functioning prior to onset of illness should be carefully monitored for future suicide attempts, as they are 5.6 times more likely than those with good premorbid functioning and no previous attempts to have subsequent attempts.

The results of the current study have several implications for practice. The findings suggest that premorbid functioning may have prognostic value across the sexes and among different diagnoses. Consequently, more careful attention to suicide risk among persons with poor premorbid functioning is warranted. Early identification of persons with histories of attempts and poor premorbid functioning could enhance existing therapeutic services when treatment is first started. For example, as noted by others (Pompili et al., 2008), interventions specifically geared towards improving overall functioning early in the course, such as social skills training and vocational rehabilitation, could within a supportive context potentially reduce the rates of subsequent suicide attempts. Thus, the accuracy of treatment planning, suicide prevention programs, and goal setting might be improved by taking into account the prognostic value of functioning prior to illness.

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Contributors

SB, JR and EB conceptualized the study. EB provided the data, helped interpret the results, reviewed drafts and approved the final manuscript. SB and JR analyzed and interpreted the data. SB reviewed the literature and drafted the paper. JR extensively reviewed and edited drafts and approved the final manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest relating to this study.

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