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Suicide attempts preceding completed suicide

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Background This study investigated three questions with major implications for suicide prevention: the sensitivity of the history of previous suicide attempt(s) as an indicator of suicide risk, the time interval from a preceding suicide attempt to the fatal one, and switching of suicide methods by those eventually completing suicide.

Method The lifetime history of suicide attempts and the methods the victims (n=1397) used were examined in a nationwide psychological autopsy study comprising all suicides in Finland within a 12-month research period in 1987–1988.

Results Overall, 56% of suicide victims were found to have died at their first suicide attempt, more males (62%) than females (38%). In 19% of males and 39% of females the victim had made a non-fatal attempt during the final year. Of the victims with previous attempts, 82% had used at least two different methods in their suicide attempts (the fatal included).

Conclusions Most male and a substantial proportion of female suicides die in their first suicide attempt, a fact that necessitates early recognition of suicide risk, particularly among males. Recognition of periods of high suicide risk on the grounds of recent non-fatal suicide attempts is likely to be important for suicide prevention among females. Subjects completing suicide commonly switch from one suicide method to another, a finding that weakens but does not negate the credibility of restrictions on the availability of lethal methods as a preventive measure.

A history of past suicide attempts is one of the most powerful and clinically relevant predictors of eventual suicide. A recent meta-analysis estimated the standardised mortality ratio (SMR) for completed suicide of subjects who had attempted suicide by any method to be about 38, higher than (for example) the risk related to any specific psychiatric diagnosis, including major depression or alcoholism (Harris & Barraclough, 1997). Overall, it is estimated that about 10–15% of persons in contact with health-care services as a result of their first lifetime suicide attempt do eventually die by suicide (Cullberg *et al*, 1988; Maris, 1992), the risk being highest during the first year after an attempt. Thus, for the purposes of suicide prevention, an individual's history of suicidal behaviour is a major help in identifying subjects with particularly high risk of suicide in the future (Lewis *et al*, 1997; Taylor *et al*, 1997).

SUICIDE ATTEMPTS AS INDICATOR OF SUICIDE RISK

Despite its great public health potential, the sensitivity of a history of previous suicide attempts as an indicator of suicide risk has been little investigated. Robins *et al* (1959) and Maris (1981) found that 78% of the 134 consecutive suicides in St Louis in 1956–1957 and 75% of the 266 suicides in Cook County, Illinois in 1966–1968, respectively, had died at their first attempt. In the San Diego Study, conducted in San Diego County, California, in 1981–1982, 62% of 204 suicides were found to have died at the first attempt (Carney *et al*, 1994). Among the 116 East Taiwanese suicide victims investigated by Cheng (1995) in 1989–1991, 79% were first-time attempters. Recently, Conwell *et al* (1998) reported 58% of the investigated 141 suicides in Monroe County in 1989–1992 to have died at the first lifetime attempt. Thus, these five studies with an overall 861 suicides suggest that the sensitivity of a lifetime history of suicide attempts may be limited, particularly among the older victims (Maris, 1981; Carney *et al*, 1994; Conwell *et al* 1998).

The history of previous suicide attempts is also of major interest to public health for other reasons. The question of substitution of suicide methods, that is switching from one intended suicide method to another if the availability of the first is restricted, is unresolved. If subjects do not tend to substitute other methods, then reducing the availability of lethal methods such as firearms, or antidepressants which are toxic in overdose, can be expected to reduce suicide mortality. However, if substitution does occur, restrictions will not necessarily result in any change in overall suicide mortality, although death rates using a particular method may decline. Obviously, there is no ethically acceptable way to investigate this issue experimentally, nor can suicide completers be surveyed. The only valid method is to utilise 'natural experiments': to investigate retrospectively how suicide completers have behaved in choosing suicide methods. Although there have been population-level studies (Gunnel & Frankel, 1994), to our knowledge no previous study has investigated whether individual suicide victims who had a history of preceding non-fatal attempts have switched suicide methods for the lethal act.

In the present study we investigated the history of suicidal behaviour prior to suicide, utilising the database of the largest psychological autopsy study yet undertaken, of the 1397 suicides in Finland during the 12-month research phase of the National Suicide Prevention Project. Specifically, we investigated the number of suicide attempts which victims had made in their lifetime (among those with a history of previous suicide attempts); the length of the interval between the final suicide attempt and the one preceding it; and the proportion of suicide attempters who had used at least two different suicide methods during their lifetime, that is switched from one method to another.

METHOD

This study is part of the National Suicide Prevention Project in Finland. Finland has an ethnically homogeneous population of five million. During the research phase of the project, all suicides committed in

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Finland between 1 April 1987 and 31 March 1988 (n=1397) were comprehensively recorded and analysed using the psychological autopsy method. The definition of suicide was based on the Finnish law for determining causes of death – in every case of violent, sudden or unexpected death the possibility of suicide is assessed by police and medico-legal investigations involving autopsy and forensic examinations. For the 12-month duration of the research phase of the project, this data gathering covered more details than usual. Data concerning victims classified as suicides in forensic examination were collected via comprehensive interviews of the relatives and attending health-care personnel, from psychiatric, medical and social agency records, and from suicide notes (Marttunen *et al*, 1991; Henriksson *et al*, 1993).

Interview forms were designed for the project, and the interviewers were mental health professionals trained in their use. Four types of interview were carried out.

(a) Face-to-face interviews of family members were usually conducted in their homes, with informed consent obtained beforehand. The structured interview forms contained 234 items concerning the victim's everyday life and behaviour, family factors, use of alcohol and other drugs, previous suicidality, help-seeking and recent life events. This interview was undertaken for 895 (83%) of the 1077 male and 260 (81%) of the 320 female suicide cases.

(b) Health-care professionals who had attended the victim during the previous 12 months were interviewed face-to-face, using a structured form containing 113 items about the victim's state of health, treatment in the health-care system, psychosocial stressors and level of functioning; an interview was conducted in 404 (38%) of the male and 208 (65%) of the female cases.

(c) The victim's last contact with a health or social agency professional was evaluated separately by interviewing the professional either face to face or by telephone using a semi-structured interview containing eight items. This was undertaken in 624 (58%) of the male and 236 (74%) of the female cases.

(d) Additional unstructured interviews were carried out by telephone if needed. Information was also taken from psychiatric and medical records (844 of the males (78%) and 285 of the females (89%)), police and forensic reports (100%), suicide notes (285 of the males (26%) and 104 of the females (33%)), and other available records on the cases and controls. A multi-disciplinary team discussed all the cases, and comprehensive case reports were written on the basis of all information available.

Here we report the lifetime numbers of previous suicidal attempts on the basis of all available information. The interview with the next of kin included questions concerning the total number of previous suicide attempts, as well as their timing and the methods used (method recorded from no more than the first five non-fatal attempts). In addition, the lifetime number of suicide attempts was determined from the records available. Since substantially more of the females had had contacts with psychiatric care during their lifetime (females 76% *v.* males 48%), more data were recorded, and more professionals were interviewed, about the females. To control for this possible information bias between genders, we estimated, by interviews of the available next of kin (83% of males and 81% of females) the difference in the proportion of reportedly first-time attempters among suicides, for both genders, and in two different ways: (a) the proportion derived from the interviews of next of kin as the only source (no gender bias); and (b) according to all available information from all interviews and records, the latter including more data sources for females.

The study population comprised 1077 male and 320 female suicides. The mean age of the males (43.6 years, s.d. 16.8 years, range 9–89 years) was 4.6 years lower (t=−4.29, d.f.=1395, $P\leqslant 0.001$) than that of the females (48.2 years, s.d. 16.4 years, range 15–87 years). The methods used in completed suicides are shown in Table 1. A number of previous papers from our group have reported on these suicides, covering their social backgrounds (Heikkinen *et al*, 1995), mental disorders (Marttunen *et al*, 1991; Henriksson *et al*, 1993), treatments received for depression (Isometsä *et al*, 1994, 1996), communication of suicide intent (Isometsä *et al*, 1995) and toxicological findings (Ohberg *et al*, 1996).

Because of occasional missing, unreliable or conflicting data, the exact numbers of cases included in the analyses are indicated in square brackets in the results section. The statistical methods used include two-tailed χ^2-tests, the two-sample t-test, the Kruskal–Wallis test and the Mann–Whitney rank sum test.

RESULTS

Both the mean (males 1.92 *v.* females 2.68) and median (males median 1, s.d. 2.52, range 1–51, *v.* females median 2, s.d. 2.86, range 1–30; Kruskal–Wallis test, d.f.=1, χ^2=62.1, $P<0.0001$) numbers of lifetime suicide attempts, fatal included, were higher among females than males. As indicated in Table 2, a significantly higher proportion of males died at their first suicide attempt (males 62% (632/1032) *v.* females 38% (118/314), χ^2=54.6, d.f.=1, $P<0.0001$).

Table 1 Suicide methods used by the 1397 consecutive suicide victims in Finland during the 12-month research period in 1987–1988

Suicide method	Males (n=1077)		Females (n=320)		Total (n=1397)	
	n	(%)	n	(%)	n	(%)
Hanging	372	(34.5)	95	(29.7)	467	(33.4)
Firearms and explosives	288	(26.7)	4	(1.2)	292	(20.9)
Drug overdose	129	(12.0)	129	(40.3)	258	(18.5)
Carbon monoxide	118	(11.0)	6	(1.9)	124	(8.9)
Drowning	53	(4.9)	43	(13.4)	96	(6.9)
Jumping under vehicles	32	(3.0)	17	(5.3)	49	(3.5)
Jumping from high places	29	(2.7)	14	(4.4)	43	(3.1)
Cutting or piercing	27	(2.5)	5	(1.6)	32	(2.3)
Poisons	9	(1.0)	1	(0.3)	10	(0.7)
Car accident	6	(0.6)	1	(0.3)	7	(0.5)
Other methods	14	(1.3)	5	(1.6)	19	(1.4)

Males *v.* females: χ^2=243.1, d.f.=10, $P<0.0001$.

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Table 2 The ordinal number of fatal suicide attempts for all suicides in Finland during the research period in 1987–1988[1]

Ordinal number of attempt which was fatal	Males (n=1026)		Females (n=311)		Total (n=1337)	
	n	(%)	n	(%)	n	(%)
Age < 45 years[2]						
First attempt	341	(57)	37	(27)	378	(51)
Second attempt	124	(21)	31	(23)	155	(21)
Third attempt	53	(9)	25	(19)	78	(11)
Subsequent attempt	82	(14)	42	(31)	124	(17)
Total	600	(100)	135	(100)	735	(100)
Age ⩾ 45 years[3]						
First attempt	291	(68)	81	(46)	372	(62)
Second attempt	88	(21)	49	(28)	137	(23)
Third attempt	24	(6)	22	(12)	46	(8)
Subsequent attempt	23	(5)	24	(14)	47	(8)
Total	426	(100)	176	(100)	602	(100)
All age groups[4]						
First attempt	632	(62)	118	(38)	750	(56)
Second attempt	212	(21)	80	(26)	292	(22)
Third attempt	77	(7)	47	(15)	124	(9)
Subsequent attempt	105	(10)	66	(21)	171	(13)
Total	1026	(100)	311	(100)	1337	(100)

1. Altogether 60 cases (51 male, 9 female) excluded; 51 due to uncertainty as to previous attempts or not, and nine due to unreliability of the exact number of attempts.
2. Males v. females: χ^2=48.4, d.f.=3, P<0.0001.
3. Males v. females: χ^2=31.3, d.f.=3, P<0.0001.
4. Males v. females: χ^2=64.0, d.f.=3, P<0.0001.

When comparing the proportions of first-time attempters ascertained only from interviews with next of kin, with the number based on all available information, a similar difference was found for both genders (males 8% (68/882) v. females 7% (17/258) were discrepant cases, χ^2=0.363, d.f.=1, NS), suggesting no gender-related information bias.

Among the victims with a history of previous suicide attempts, the distribution of the time interval between the preceding and the fatal suicide attempt differed between men and women (Table 3); in 19% (191/1022) of male and 39% (122/311) female suicides (χ^2=56.0, d.f.=1, P<0.0001) a preceding suicide attempt had occurred during the final year before the lethal attempt.

For the total of 587 victims known to have previously attempted suicide, data on the methods used were available for 421 (72%) cases. The methods were reported only for the five first attempts, which limits the validity of the findings on the 38 cases (6%) who had made more than six attempts. The vast majority (82% (344/421)) of both the males (81% (229/282)) and females (83% (115/139)) reportedly used at least two different suicide methods in their suicide attempts (fatal included) (i.e. they had switched methods). The methods used in previous attempts included overdose in 86% (120/139) of females but only 54% (152/282) of males (χ^2=42.8, d.f.=1, P<0.0001). Specifically, of victims who had made previous attempts and who eventually died by hanging, a markedly higher proportion of females (82% (32/39)) than males (42% (41/98); χ^2=18.1, d.f.=1, P<0.001) had tried overdose, whereas a significantly higher proportion of the males (38% (37/98) had previously attempted to hang themselves (females 18% (7/39); χ^2=5.02, d.f.=1, P=0.025).

Table 3 The interval between the fatal and the preceding suicide attempt among suicide victims not dying at their first lifetime suicide attempt[1]

Time period	Males		Females		Total	
	(n=390)	Cumulative %	(n=193)	Cumulative %	(n=583)	Cumulative %
0 to 7 days	18	(5)	10	(5)	28	(5)
8 to 30 days	31	(13)	31	(21)	62	(15)
31 to 90 days	51	(26)	32	(38)	83	(30)
91 to 364 days	91	(49)	49	(63)	140	(54)
12 to 23 months	51	(62)	18	(73)	69	(66)
24 to 59 months	57	(77)	15	(80)	72	(78)
59 to 119 months	40	(87)	16	(89)	56	(87)
10 years or more	51	(100)	22	(100)	73	(100)

1. Four cases excluded due to missing data.
Males v. females: Mann–Whitney rank sum test, z (corrected for ties)=2.53, P=0.01.

DISCUSSION

The present study is based on a uniquely large psychological autopsy database representing all suicides in Finland during the 12-month research period in 1987–1988. We found that the majority of all suicide completers (56%) had died at their first suicide attempt, though the proportion was markedly lower among females, of whom only 39% had made a preceding attempt during the final year. The vast majority (82% combined) of the victims of both genders who had made prior attempts, and for whom reliable data were available, had switched suicide methods at least once.

Some limitations of this study need to be noted. The generalisability of our findings from Finland to other countries needs to be verified, because suicide mortality rates and gender differences vary between different countries and cultures (World Health Organization, 1993). In addition, the present study shares the well-known methodological problems related to retrospective studies in general, and the psychological autopsy method specifically (Clark & Horton-Deutsch, 1992). To some extent these can be overcome by using several informants and including data from both interviews and official records, as in the present study.

Another important methodological question relates to the definition of a suicide attempt, which is a conceptual problem. We included as attempts only cases

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where the subject had really undertaken the intended act: ingested the overdose, pulled the trigger, etc. Despite some unavoidable ambiguity in the definition of a suicide attempt, we are not aware of any bias in the reporting of previous attempts. As we found a history of previous suicide attempts to be more prevalent (44%) than did the other five smaller studies (21–42%) mentioned earlier (Robins *et al*, 1959; Maris, 1981; Carney *et al*, 1994; Cheng, 1995; Conwell *et al*, 1998), we think it unlikely that our study would have resulted in an underestimate of the sensitivity of such a history as an indicator of future suicide risk.

More than half of suicide victims in Finland die at their first lifetime suicide attempt. Male completers, in particular, are usually (62%) first-timers. Thus the sensitivity of a history of suicide attempts as a risk indicator in men is relatively low (0.38); furthermore, any preceding attempts are less strongly time-related to the lethal one than among women. Of women who completed suicide, almost two-thirds (62%) had a history of previous attempts – usually one or two, with the last occurring during the final year in more than one-third (39%) of cases. Thus the potential for preventing suicide by consultation, treatment and follow-up of suicide attempters seems considerably higher among women. However, it should be remembered that male suicide attempters are a subgroup of patients with a high risk of eventual suicide.

It is clear from our findings that subjects who eventually completed suicide had usually switched methods if they survived an earlier attempt(s). Among females, the eventual suicides seemed to commonly have switched from (non-lethal) overdoses in the previous attempt(s) to other more lethal methods in the fatal attempt. Among the minority of males with previous attempts, the pattern seemed more complex. Quite apart from the issue of a change of method when availability of a lethal method is restricted, our findings indirectly support the hypothesis of method substitution in general, at least for a significant proportion of eventual suicides, thus weakening the credibility of restricting the availability of lethal methods as a preventive measure.

However, this does not necessarily imply that a policy of restricting the availability of a method has no effect at all. First, it may be that some suicides are prevented because an acceptable method is unavailable. Second, restricting the availability of the most lethal methods might result in suicide attempters using less lethal methods, which would increase the proportion of surviving attempters. Third, however, it cannot be *a priori* excluded that restricting access to medium-range lethality methods, such as tricyclic antidepressants would result in a higher proportion of serious suicide attempters using a more lethal method, such as hanging. The net effect of a well-meaning restriction could then even be negative in terms of suicide mortality, if the probability of death is markedly higher with the more lethal method chosen. It is of interest that despite well-documented differences in toxicity and antidepressant-specific suicide rates (Cassidy & Henry, 1987; Kapur *et al*, 1992; Henry *et al*, 1995), Jick *et al* (1995) found no differences in overall suicide mortality among depressed patients treated with different antidepressants in primary health-care. They found that only a minority of depressed patients treated with antidepressants used drug overdose as a suicide method, and more of those on less toxic antidepressants used violent suicide methods (Jick *et al*, 1995). These findings are fully in accordance with our present and earlier (Isometsä *et al*, 1994; Ohberg *et al*, 1996) findings, as well as with those from other major studies (Isacsson *et al*, 1994).

In conclusion, we found that the majority of male and a considerable proportion of female completed suicides died at their first suicide attempt. A need for the early recognition of suicide risk, particularly among males, thus seems evident. As the vast majority of suicide completers who have made previous attempts have used at least two different suicide methods, substituting one method for another can be

CLINICAL IMPLICATIONS

- Most male completed suicides die in their first suicide attempt. Risk of suicide among men must therefore be recognised early, before the first suicide attempt.
- One-quarter of all suicide subjects are women. Treatment and follow-up of suicide attempters may be a more feasible means of preventing suicides among women than among men.
- Completed suicides who had survived an earlier suicide attempt had usually switched to another lethal method. Restricting availability of one lethal method may not prevent a subject with strong suicide intent from using another.

LIMITATIONS

- The generalisability of findings from Finland to other countries needs to be investigated.
- The definition of suicide attempts is unavoidably somewhat ambiguous, and thus a potential source of error and variation.
- Of the 587 suicide victims known to have previously attempted suicide, data concerning the methods used in these were conflicting, unreliable or missing in 28%.

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expected if availability of one method were to be restricted.

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