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Title: Suicide attempters' memory traces of exposure to suicidal behaviour; a qualitative pilot study

Short Title: MEMORY TRACES OF EXPOSURE TO SUICIDAL BEHAVIOUR

Article Type: Research Trend

Keywords: Attempted suicide; social modelling; episodic memory; narrative interview

Corresponding Author: Prof. Konrad Michel, M.D.

Corresponding Author's Institution: University Hospital of Psychiatry

First Author: Domenico Ventrice, med. pract.

Order of Authors: Domenico Ventrice, med. pract.; Ladislav Valach, Ph.D.; Thomas Reisch, M.D.; Konrad Michel, M.D.

Abstract: Background: Individuals in the course of their lives may encounter knowledge about suicide in various ways, e.g. directly, through suicidal behaviour in the family or among peers, or, indirectly, through hearsay, the media, literature, etc. Aims: The goal of the study was to investigate such memory traces (engrams) in patients with and without a suicide attempt. Method: Ten patients of a psychiatric crisis unit who had attempted suicide and ten patients without a history of suicidal behaviour were interviewed with a narrative/semi-structured interviewing technique. Interviews were video-recorded and fully transcribed. Stepwise reduction of the content was used to develop categories of recurrent memories and models of suicidal behaviour. Results: Suicide attempters reported more memories of direct exposure to suicidal behaviour (e.g. witnessing a suicidal act) than patients who had no history of attempted suicide. They also reported more own suicidal crises, but associated them more often with interpersonal problems than with depression. They considered suicide more often as normal behaviour than non-attempters. The total numbers of suicide-related memories and their origins were remarkably similar in both groups. Conclusions: The results suggest that direct exposure to suicidal behaviour may leave engrams (memory traces) that increase an individual's susceptibility to suicidal behaviour.

Suggested Reviewers:

Opposed Reviewers:

Response to Reviewers: Changes:

Reviewer 1

Considering the results of the Mercy et al. study:

- the discussion of the Mercy et al. study has now been added (the first paragraph in the discussion section has been re-written accordingly, stressing the difference in the method).
- the following summary paragraph has been revised accordingly.

Reviewer 2

- The title has been changed.
- The theory of engrams as cognitive schemas is now mentioned in the introduction.
- Evidence for the relationship of engrams with suicidal behavior. We believe that this point is partly covered by the references cited in the introduction (Zahl & Hawton, Dervic et al., De Leo & Heller). In addition, in the introduction reference is now made to anxiety- and trauma-related schemas (=the suicidal mode) that may be reactivated.
- Definition of attempted suicide: This is now provided (WHO/EURO Multicentre Study).
- Number of subjects in the study: Small numbers such as 2 x 10 individuals are typical for qualitative studies, where content analysis of patients' accounts, with emerging categorization is the primary goal.
- Narrative interviewing: This is now explained and referenced, also in contrast to other interviewing methods (discussion).
- Cronbach's alpha is now provided for BDI and SOQ.
- Unequal gender distribution: The differences between subjects with and those without suicide attempt in regard to reporting direct suicide experience holds when controlling for gender. A sentence has now been added in the results section.
- Differences between groups due to one or two individuals? Analyzing the data with subjects as cases (whether or not the critical statements were made by the person) indicates a wide distribution of variables. Thus, we can conclude that the differences are not due to one or two individuals making a high number of the key statements.
- Conclusions: have been tempered somewhat as required. For instance: It is possible, therefore, that exposure to suicide in a direct way (finding the dead person, experiencing a family member repeatedly threatening suicide) leaves a stronger impact on the person. We believe that in the abstract, the conclusions have been adequate to the study's limitations: "The results suggest that direct exposure to suicidal behaviour may leave engrams (memory traces) that increase an individual's susceptibility to suicidal behaviour.

Furthermore, the recent study by Pirelli and Jeglic (2009) has now been included in the discussion.

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3 Running head: MEMORY TRACES OF EXPOSURE TO SUICIDAL BEHAVIOUR
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12 Suicide attempters' memory traces of exposure to suicidal behaviour; a qualitative
13 pilot study
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17
18 Domenico Ventrice

19
20 University Hospital of Psychiatry, Bern, Switzerland

21
22 Ladislav Valach

23
24 Independent private practice, Burgdorf, Switzerland

25
26
27 Thomas Reisch, Konrad Michel

28
29 University Hospital of Psychiatry, Bern, Switzerland
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39 Correspondence:

40 Konrad Michel, M.D.

41
42 University Hospital of Psychiatry

43
44 Murtenstrasse 21

45
46 CH-3010 Bern

47
48 Switzerland

49
50 Tel +41 31 632 8811, Fax +41 31 632 89 50

51
52 E-mail: konrad.michel@spk.unibe.ch
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Abstract

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2 *Background:* Individuals in the course of their lives may encounter knowledge about
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4 suicide in various ways, e.g. directly, through suicidal behaviour in the family or
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6 among peers, or, indirectly, through hearsay, the media, literature, etc. *Aims:* The
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18 develop categories of recurrent memories and models of suicidal behaviour. *Results:*
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20 Suicide attempters reported more memories of direct exposure to suicidal behaviour
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22 (e.g. witnessing a suicidal act) than patients who had no history of attempted suicide.
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24 They also reported more own suicidal crises, but associated them more often with
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26 interpersonal problems than with depression. They considered suicide more often as
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28 normal behaviour than non-attempters. The total numbers of suicide-related
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30 memories and their origins were remarkably similar in both groups. *Conclusions:* The
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32 results suggest that direct exposure to suicidal behaviour may leave engrams
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34 (memory traces) that increase an individual's susceptibility to suicidal behaviour.
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46 **Keywords:** Attempted suicide; social modelling; episodic memory; narrative interview
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51 *"An impression may be so exciting emotionally as almost to leave a scar upon*
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53 *the cerebral tissues"* (James, 1890, p. 670).
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59 Suicide is the last stage of individual developmental processes, for which Maris
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61 (1981) used the term "suicidal careers". The development towards suicide
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1 encompasses a large variety of factors, such as suicide in the family, social role
2 models, repeated experiences of personal failure, considering suicide, etc. Estimates
3 of lifetime prevalence of suicide ideation range from 8.9% to 64.8% (Bille-Brahe,
4 1997). A survey in the US (Kessler et al., 1999) among a population aged 15 to 54
5 years reported a probability of 26% for the transition from suicide ideation to a suicide
6 attempt, and a probability of 72% for the transition from suicide plan to a suicide
7 attempt. It can be assumed that the notion of suicide as an option in human life is
8 common knowledge in a society. Suicidal behaviour also has a strong cultural
9 element, which, for instance in Hungary, includes the notion of suicide as an
10 honourable act (Leach, 2006; Goldston et al., 2008).

11 On a more individual level, it can be assumed that individuals in the course of
12 their life encounter the notion of suicide as an option in various ways, e.g. through
13 suicidal behaviour in the family or among peers, hearsay, literature, the media, etc.
14 Suicidal behaviour can thus be seen as the result of social learning or modelling
15 (Bandura, 1986, 1977). For instance, Zahl & Hawton (2004) found that young
16 patients, who had harmed themselves, often identified media portrayals as the
17 source of their attitudes or behaviour related to self-harm and suicide. A recent study
18 in Vienna reported that exposure to suicidal behaviour in peers was frequent among
19 adolescents; 45% had “first hand” experience with suicidal peers (Dervic et al.,
20 2007). In a study by De Leo & Heller (2008), adolescent suicide attempters were
21 more likely to have known someone who had completed suicide compared to others
22 who had never attempted suicide. Similarly, a history of self-harm in the family was
23 significantly more frequent in suicide attempters. Experiencing suicidal behaviour in
24 family members may – besides genetic transmission - be one of the factors
25 responsible for the familial transmission of suicidal behaviour (Melhem et al., 2007).

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The meaning of episodic memories may vary in personal relevance for an individual, depending on the emotional loading of past events. Cognitive theories assume the existence of schemas that may be activated in specific situations. These involve all aspects of information processing including selection of data, attentional processes, memory, and subsequent recall. Integrated cognitive-affective-behavioral schemas associated with physiological arousal have been associated with the concept of the mode (Beck, 1996). More specifically, Rudd, Joiner, Rajab (2001) have described the suicidal mode, which may be triggered by internal and external stressors.

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We hypothesized that individuals who have attempted suicide, would differ in their engrams (memory traces) of exposure to suicidal behaviour from individuals who had never attempted suicide. More specifically, we expected patients who had made a suicide attempt to have more explicit memories than controls. A narrative interviewing followed by semi-structured cueing was chosen in order to allow individual associations of memories related to the same subject. The narrative approach (Angus et al., 2004) is characterized by open questions inviting the patient to answer in the form of short stories, telling the interviewer about significant personal memories as they come to his or her mind. The semi-structured part consisted of additional questions probing for possible origins of engrams that were not mentioned in the patients' spontaneous recall (e.g. "Do you recall any suicidal behavior in school, or in the media?")

51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 Method

Patients

Patients admitted to the crisis unit were asked to participate in the study. Exclusion criteria were psychotic disorders (ICD-10: F2), substance abuse as a primary diagnosis (ICD-10: F1), dementia (ICD-19: F0), and acute suicidality (current

1 suicidal plans). Ten consecutively admitted patients who had attempted suicide and
2 ten patients without a history of attempted suicide were included. Attempted suicide
3 was defined according to the definition used in the WHO/EURO Multicentre Study on
4 Suicide and Attempted Suicide (Platt et al., 1992). Patients were told that the
5 objective of the study was to better understand when and how people throughout
6 their lives were confronted with suicidal behaviour as an option in a person's life.
7 Patients gave written consent for the interviews to be video-recorded. The study was
8 approved by the local ethics committee.

19 *Interviews*

21 After two pilot interviews, patients were interviewed using a combination of
22 narrative and semi-structured interviewing technique (Smith, 2000; Bartholomew et
23 al., 2000). Interviews started with a narrative opening: "Consider a child does not
24 know that people can and do kill themselves. Please try to go back in your life and
25 tell me what experiences you remember in which you were confronted with the idea
26 that suicide maybe an option in human life". In the second part of the interview, a
27 number of cues were used ("looking back, do you see any other events that are
28 related to suicide? For instance, there may have been suicidal behaviour in your
29 family, or at school"). Once an individual list of events was completed, persons were
30 asked to rate the subjective self-relevance of each of these engrams on a scale of 1
31 – 10 (participant coded semi-structured interviewing, see Bartholomew et al., 2000).

48 *Content analysis and coding*

51 The interviews were video-recorded and fully transcribed. For thematic analysis,
52 principles of grounded theory (Strauss, 1987; Green, 1998) were used, with a
53 stepwise reduction of content leading to an emerging categorization of recurrent
54 models of suicidal behaviour. Emerging categories of memories related to suicidal
55 behaviour were regularly discussed in the group of raters (KM, LV, TR), and

1 categories were defined. The coding system included eight categories related to
2 characteristics of recalled suicidal behaviour (e.g. direct/indirect, suicide method
3 specified), ten categories related to reasons given for suicidal behaviour (e.g.
4 relationship problems, depression), and eight categories related to the origin of
5 suicide as a model (e.g. family, school, media).
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11 Categorical coding of interview passages relating to the research topic was
12 performed by LV, TR and KM. Interrater agreement over all categories was
13 “substantial”, with a Kappa of .62 (Landis & Koch, 1977).
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19 *Coding example*

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21 *“I was confronted with suicide very early in my life, in the first year at school.*
22 *The mother of a schoolmate threw herself under a train. Up to then, i.e. the age of*
23 *seven, suicide had been a taboo theme at home, and this event, I have to say,*
24 *shoked me quite a bit. Later, I heard that this woman was about to become blind and*
25 *therefore had escaped from this life, which is somehow understandable...”.* Coding
26 categories: (1) suicidal person: other, (2) experience: indirect, (3) suicidal act:
27 completed suicide, (4) source: schoolmate, (5) reason given: physical illness.
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39 *Questionnaires*

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41 - BDI (Beck et al., 1961) was used to assess the level of depression. The
42 German version of BDI has a good internal consistency and validity (Hautzinger,
43 1991, Hautzinger et al., 1994).
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48 - The Suicide Opinion Questionnaire (SOQ; Domino, 1996) was used to assess
49 patients’ attitudes towards suicide as an option in life. It includes four factor
50 analytically-derived scales proposed by the authors: The mental illness scale,
51 normality scale, right to die scale, and cry for help scale. The SOQ is a self-
52 administered questionnaire using a five-point Likert-type response format. The
53 questions were translated into German and revised after backtranslation.
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Statistical analysis

Chi-Square tests were utilized to assess the significance of the differences between the frequencies of the categorical variables in the two studied groups (patients with and patients without a recent suicide attempt). The non-parametric Mann-Whitney U test was used for testing the significance of differences between the scores in the SOQ in the two studied groups. Additionally, odds ratios were calculated to estimate the differences in probability between the two groups.

Results*Patients*

Suicide attempters (8 female, 2 male): The mean age was 37.0 (range 22-43). The time lapse between the last suicide attempt and the interview ranged from three weeks to 25 years (one case). The average number of attempts was 1.5, range 1-5.

The mean BDI score was 28.5 (SD=12.3, range 13-48), with a Cronbach's alpha of .92. Clinical diagnoses were: Depressive episode (7), bipolar disorder (3); in 3 cases an axis II diagnosis of personality disorder was made.

Non-attempters (4 female, 6 male): The mean age was 35.5 (range 18-51). Mean BDI score 24.7 (SD=13.7, range 6-40). Clinical diagnoses were: Depressive episode (8), bipolar disorder (1), obsessive-compulsive disorder (1), social phobia (1); in 2 cases an axis II diagnosis of personality disorder was made.

There was no difference in the BDI scores between attempters and non-attempters (Mann-Whitney U Test, $U=27.5$, $p=.68$), nor was there any correlation of BDI scores with the Suicide Opinion Questionnaire.

Table 1 about here

Memories of exposure to suicidal behaviour (Table 1)

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Suicide attempters did not differ from non-attempters in the total number of reported memories of exposure to suicidal behaviour (98 vs. 94 engrams), nor did they differ in the proportion of memories of indirect exposure (family, friends, school, media, etc.) to suicidal behaviour (47% vs. 54%; Chi-Square, $p > .05$). However, suicide attempters reported a higher proportion of engrams of *direct exposure to suicidal behaviour* of others (14%; $N=94$) (e.g. witnessing suicide or suicide threats by others) than non-attempters (2%; $N=98$) (Chi-Square=9.3, df_1 , $p = .002$; odds ratio (OR): 7.7, 95% confidence interval (CI): 1.69-35.15). The difference is even more striking when individuals are compared: Eight (out of 10) suicide attempters remembered events of direct exposure, while only 2 (out of 10) non-attempters did so (Chi-Square=7.2; $p = .007$; OR=16.0, 95% CI 1.79-143.15). These differences held when controlled for gender.

Out of the total of 192 memories reported, 104 events were related to cases of completed suicide, with no difference in frequency between suicide attempters and non-attempters (49% vs. 51%), while only 20 reports were related to someone attempting or threatening to attempt suicide. Suicide attempters more often reported own suicidal crises in the past (24% vs. 7%; Chi-Square=10.9, df_1 , $p = .001$).

Table 2 about here

Sources of information about suicidal behaviour (Table 2)

There was remarkable similarity in the numbers of sources of the suicidal behaviour in both groups. Most reported suicidal behaviours took place in the circle of friends and family.

Reasons given

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There were no significant differences between attempters and non-attempters in the reasons given for suicide in general (“what would you say can get a person to commit suicide?”), although suicide attempters tended to associate suicide more often with relationship problems (15% vs. 7% of the citations; Fisher’s exact test, $p=.068$) and with physical illness (6% vs. 1% of the citations; Fisher’s exact test, $p=.053$), compared with depression (14% vs. 20%, NS).

Suicide Opinion Questionnaire

Suicide attempters saw suicide more often as “normal” (SOQ scale 6, Normality scale; Mann-Whitney U test, $U=17$, $p < .05$; Cronbach’s alpha $=.70$). The groups did not differ in the subscales 5 (impulsivity), 7 (aggression), 8 (suicide is morally bad), but they differed in the total score (Mann-Whitney U test, $U=24$, $p=0.05$, Cronbach’s alpha $=.75$). The two groups also differed in their responses to item 106 of the SOQ (“What is the probability that at some point in your life you might attempt suicide?”). Here, none of the suicide attempters indicated the suicide probability as zero, five indicated a probability of less than 10%, while four rated their suicide likelihood as 50% and higher. There was a significant correlation between attempting suicide and the subjective indication of a probable suicide (Pearson r ; $p=0.04$, though the Chi-Square did not reach the .05 level of significance).

Subjective relevance of engrams

There was no difference in the patients’ own ratings of the personal relevance of the reported events on a 10 point Likert-Scale (mean 6.01 and 6.25 for attempters and non-attempters, respectively).

Discussion

This study used a narrative approach, supplemented by semi-structured questions, investigating suicide attempters’ engrams (memory traces) of earlier

1 exposure to suicidal behaviour. It should be noted that this interviewing technique is
2 different from highly structured interviews, such as used by Mercy et al. (2001), a
3 study which, in contrast to the studies of others, found that exposure to suicidal
4 behaviour in relatives, friends, and the media had a *protective* effect. The
5 interviewing method used in our study is also different from telephone (Crosby and
6 Sacks, 2002) or online surveys (Pirelli and Jeglic, 2009). The narrative interviews
7 performed in our study were a form of associative recall searching for subjective
8 memory traces, which allowed an in-depth analysis of the patients' meaning given to
9 events. Different to quantitative research, in the qualitative method used, the
10 interviews were transcribed and the content analyzed by an emerging coding system.

11 Our main finding is that suicide attempters recalled significantly more memories
12 of direct exposure to suicidal behaviour. Surprisingly, the total number of memories
13 of exposure to suicidal behaviour did not differ between suicide attempters and non-
14 attempters. It is possible, therefore, that exposure to suicide in a direct way (finding
15 the dead person, experiencing a family member repeatedly threatening suicide)
16 leaves a particularly strong impact on the person.

17 Our results support the De Leo and Heller (2004, 2008) studies, which, using a
18 self-report questionnaire, found that adolescent suicide attempters were more likely
19 to know someone who had attempted suicide, and that a great proportion of
20 attempters had a friend with a history of deliberate self-harm. Males who had been
21 exposed to nonfatal suicidal behaviour among their friends were 21.3 times more
22 likely to engage in self-harming behaviour than males without such exposure.
23 Furthermore, De Leo et al. (2005) reported that having personally known someone
24 who had attempted suicide was associated with a higher probability of suicidal
25 ideation and suicide attempts. Stein et al. (1998) had found that adolescents exposed
26 to suicide revealed a significantly more accepting attitude. Consistent with this and
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1 other investigations, suicide attempters in our sample expressed a more accepting
2 attitude toward suicide. They also indicated a higher probability that they might some
3 day end their lives by suicide. Indeed, there is evidence that individuals who are
4 more accepting of suicide exhibit higher levels of suicidal ideation and are more likely
5 to attempt suicide (McAuliffe et al., 2003).
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11 We were surprised by the number of suicide related engrams reported by non-
12 attempters. It is possible that the narrative interviewing combined with cueing
13 questions used in our study, elicited more suicide-related engrams in the non-
14 attempters' group than questionnaire-based studies. Considering the association of
15 suicide engrams with the individual's own suicidality, a higher personal relevance of
16 certain memories, i.e. a qualitative effect, would be expected. However, suicide
17 attempters reporting events of direct exposure did not attribute a higher personal
18 relevance to them. A possible explanation could be that the emotional content of
19 such memories is not normally accessible by the individual concerned. Schacter
20 (1996) argued that we are largely unaware of our own schemas of knowledge about
21 the everyday world and ourselves. The notion of event-based prospective memory
22 assumes automatic or strategic processes that are highly dependent on
23 circumstances (McDaniel, & Einstein, 2000). Repeated activation of a specific
24 memory may increase its consolidation (Dudai and Eisenberg, 2004), for instance,
25 through endogenous activation, or activation due to external stimuli.
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48 A growing number of studies show that the ability to deal with difficult
49 situations depends much on the same neural machinery that is needed to remember
50 knowledge acquired in the past. Above all, episodic memory, which has traditionally
51 been defined as a memory system that supports the recall of personal experiences,
52 allows individuals to engage in "mental time travel" into both the past and the future
53 into a simulation of a novel event (Schacter et al., 2007). For instance, Holmes et al.
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1 (2007) recently reported that depressed patients who had been suicidal in the past
2 had detailed mental imagery about making a further suicidal attempt. The images
3 were interpreted as “flash-forwards”, similar to flashbacks in posttraumatic stress
4 disorder. In a similar vein, it is conceivable that experiences of direct exposure to
5 suicidal behaviour of others will only be reactivated if the person faces a serious
6 emotional crisis. The results are compatible with a model of suicide as part of goal
7 directed systems (Michel & Valach, 1997). This model assumes that in vivo
8 experience of suicidal behaviour of others may be relevant for the construction of
9 one’s own suicide actions in the sense of joint or socially shaped actions.
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11 Interestingly, the findings reported by Gutierrez et al. (1996) suggest that exposure to
12 death in general and not suicide in particular may be related to an increased risk of
13 suicide.
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In their narratives of memory traces of suicidal behaviour informants often provided information regarding the reasons given for suicidal behaviour. Suicide attempters mentioned relationship problems, in contrast to depression slightly more often than non-attempters. This is consistent with earlier findings that suicide attempters often do not think that they have a psychological condition which needs psychiatric treatment (Michel et al., 1994). This, of course, is in sharp contrast to professional evidence, which stresses the importance of recognition and treatment of mental disorders in order to prevent suicide. Together with the results of the normality score in the SOQ, the findings illustrate the discrepancy in thinking about suicide between health professionals and people who resort to suicidal behaviour.

Our study has obvious limitations: It has pilot-character and the conclusions are, as in many qualitative studies, limited by the small sample size. It is a retrospective study with all the limitations of such a research paradigm. The fact that some of the suicide attempts were not recent, may have made it difficult for suicide

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attempters to recall suicide-relevant memories. Suicide attempters have been reported to have a strong tendency to be overgeneral in their recall of the suicidal crisis (Williams and Dritschel, 1988). Pollock and Williams (1998) assume that overgenerality is a trait marker of individuals with poor problem solving capacity and a vulnerability to emotional disturbance – which would obviously affect the number and attribution of the reported memories. Depression may have moderated the recall of specific memories, with mean BDI scores corresponding to severe depression in both groups. Therefore, as a direction of future research, a long-term prospective study of individuals witnessing suicidal behaviour would provide more objective information on the impact of such experiences.

Conclusions

The results suggest that in assessing suicide risk, it may be useful to explore for models of suicidal behaviour related to earlier experiences of suicidal behaviour by others, above all direct exposure to suicidal behaviour by others. Such memory traces may be conscious or unconscious and may be related to a readiness to respond with suicidal behaviour to experiences of psychological impasse. Recalling events of direct exposure to suicidal behaviour (e.g. in the family) may be helpful in understanding the meaning and valence of suicide engrams on an individual's coping mechanisms as well as their possible impact on the patients suicide intentions.

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About the authors

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Domenico Ventrice, MD, is a postgraduate psychiatrist working in a day hospital of the University Hospital of Psychiatry Bern, Switzerland. On his duty rota for the University General Hospital he is regularly confronted with attempted suicide. He is interested in the background of suicidal behaviour and is preparing his doctoral thesis on this subject.

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Ladislav Valach, Dr. phil, is a psychologist and licensed psychotherapist currently working in his private practice. He is also active in suicide prevention research and is together with K. Michel, D. Jobes, A. Leenaars, J. T. Maltzberger, I. Orbach and R. A. Young a founding member of the Aeschi Working Group. He published together with R. A. Young and M. J. Lynam the book 'Action theory: Primer for applied research in social science'. He also authored and co-authored a number of papers and book chapters on counseling.

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Thomas Reisch, MD, is working as a senior psychiatrist at the University Hospital of Psychiatry Bern, Switzerland. He is the head of the inpatient psychotherapy unit. Within the Bernese Suicide Research Group. His research activities focus the topics "understanding suicide" and "suicide prevention". TR is member of the managing committee of the National Initiative for Preventing Suicide in Switzerland and the Bernese Alliance Against Depression.

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Konrad Michel, MD, is professor at the Outpatients Department of the University Hospital of Psychiatry Bern, Switzerland. He is also working in private practice. He has conducted several clinical research projects focussing on training GPs in suicide prevention, and on aspects of the patient – therapist relationship. Together with L. Valach, Ph.D., he has developed a model of understanding individual suicidal developments based on action theory. He is the initiator of the Aeschi Working Group (<http://www.aeschiconference.unibe.ch>), a group of suicidologists working together with the aim of developing models of understanding suicide that may be helpful for improving the therapeutic relationship with suicidal patients.

	Attempters		Non-attempters	
	N	%	N	%
Number of reported engrams	94	100	98	100
Number of suicidal behaviour by others	60	63	60	61
Indirect (heard, read, etc.)	44	47	53	54
Direct (witnessed) * (Fisher's exact test)	13	14	2	2
Engrams of completed suicide	51	55	53	54
Engrams of attempted suicide	13	14	7	7
Nr. of own emotional crises * (Fisher's exact test)	23	24	7	7
With suicide attempt	19	39	9	14
With suicide ideation	7	30.4	6	86

Table 1. Nature of engrams of suicidal behaviour; significance < .005 (*)

	Attempters		Non-attempters	
	N	%	N	%
Number of reported engrams	94	100	98	100
Family	13	14	12	12
Friends, acquaintances	22	23	23	24
School, schoolmates	9	10	9	9
Media (TV, newspapers)	10	11	13	13
Book	1	1	4	4
Other	6	6	1	1

Table 2. Source of information about suicidal behaviour