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Optional thinking ability among hospital-treated deliberate self-harm patients: A 1-year follow-up study

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Objectives. To investigate the association between optional thinking (the ability to generate alternative solutions to interpersonal problems) in deliberate self-harm (DSH) patients and repeated self-harm.

Design. A prospective study of the association between optional thinking in interpersonal problem solving and repeated DSH within 12 months.

Method. A non-consecutive sample ($N = 152$) of DSH patients presenting to the Accident and Emergency department of an acute hospital in Cork city, Ireland, was assessed using a structured interview schedule including the Suicide Intent Scale, the Hopelessness Scale, and the Optional Thinking Test. Repetition within 1 year was established by checking Accident and Emergency records at all three city hospitals. Participants were categorized as repeaters if they engaged in at least one further hospital-treated DSH episode, or non-repeaters.

Results. Approximately two-thirds (63.1%) of the sample had engaged in at least one act of DSH prior to their index episode. During follow-up 31 individuals (20.4%) repeated. History of self-harm was significantly associated with prospective repetition when considered alongside all the other predictor variables. Among first evers, low scores on the optional thinking test were significantly associated with the increased risk of repetition within 12 months. Among those with previous DSH, there was no evidence of an association between optional thinking and repetition within 12 months.

Conclusions. Poor optional thinking is associated with increased risk of repeated deliberate self-harm in those who present with a first self-harm episode. Interventions to improve optional thinking skills, delivered soon after a first DSH presentation, may be useful in preventing repetition.

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While problem-solving skills have been examined extensively among suicide ideators (Dixon, Heppner, & Rudd, 1994; Schotte & Clum, 1982, 1987) and patients presenting with deliberate self-harm (DSH; Linehan, Camper, Chiles, Strosahl, & Shearin, 1987; McLeavey, Daly, Murray, O' Riordan, & Taylor, 1987; Patsiokas, Clum, & Luscomb, 1979; Pollock & Williams, 2004; Rotheram-Borus, Trautman, Dopkins, & Shrout, 1990), few studies have described the problem-solving difficulties associated with repeated deliberate self-harm (Pollock & Williams, 1998). Repeaters are known to engage in significantly more passive problem solving (McAuliffe *et al.*, 2006; McAuliffe, Keeley, & Corcoran, 2002) and tend to appraise themselves more poorly at solving problems (Rudd, Joiner, & Rajab, 1996). In comparison with non-repeaters, repeaters view their problems as more insurmountable or overwhelming and regard themselves as relatively powerless over their lives (Sakinofsky & Roberts, 1990). In studies of patients with Borderline Personality Disorder, a lesser tendency to engage in reassuring and self-consoling thoughts is independently associated with repetition (Rietdijk, van den Bosch, Verheul, Koeter, & van den Brink, 2001). However, these studies use process measures of problem solving that assess attitudes and skills rather than outcome measures which assess problem-solving performance i.e. the ability of individuals to successfully apply their problem-solving skills to a given problem (D'Zurilla & Maydeu-Olivares, 1995).

Outcome measures of problem-solving ability have been used to identify compromised problem-solving performance in those who engage in deliberate self-harm, including a lack of diversity in coping with impersonal problems (Patsiokas *et al.*, 1979; Schotte & Clum, 1987) and a specific difficulty in developing alternative solutions to their interpersonal problems (Schotte & Clum, 1987). The ability to generate alternative solutions is a key outcome measure of interpersonal problem-solving cognition that facilitates the production of effective solutions (Goldfried & Goldfried, 1980). Individuals who are capable of generating large numbers of problem-oriented options are more likely to conceive of good solutions to problems (Parnes & Meadow, 1959). Optional thinking is one aspect of problem-solving ability likely to be important in the association between environmental factors – for example, poor parenting, early exposure to stressful life-events – and subsequent suicidal behaviour. A number of models based on the original interactional model of suicidal behaviour by Braucht (1979) incorporating both individual and environmental factors, outline how problem-solving ability influences other associated risk factors for DSH in setting the context in which it can occur. For example, early exposure to chronic stress may adversely affect the development of problem-solving ability (Carriss, Sheeber, & Howe, 1998; Clum, Patsiokas, & Luscomb, 1979; Yang & Clum, 2000). There is evidence that good problem solving – as a stable trait characteristic – protects against DSH, irrespective of depression or hopelessness levels (Dieserud, Røysamb, Ekeberg, & Kraft, 2001). According to the well-established diathesis–stress model first proposed by Clum and colleagues (Clum *et al.*, 1979; Schotte & Clum, 1982, 1987), deficits in interpersonal problem solving (including optional thinking) under conditions of high stress give rise to a depleted repertoire of alternative solutions, leading to hopelessness, and in this way increase the likelihood of suicidal ideation.

Cognitive rigidity has been operationally defined as an inability to identify problems and corresponding solutions adequately (Levenson, 1972; Menninger, 1938; Neuringer, 1964; Patsiokas *et al.*, 1979; Shneidman, 1957). Dichotomous thinking is a form of cognitive rigidity (Weishaar, 1996) in which the individual has a tendency to categorize experiences into one of two polar extremes (Weishaar & Beck, 1992) so that they are evaluated as either 'awful' or 'wonderful' but are rarely evaluated as 'alright/ok'.

Suicide ideators demonstrate a greater degree of dichotomous thinking (extreme judgments; Litinsky & Haslam, 1998; Neuringer & Lettieri, 1971) and significantly more field dependence – in terms of how they locate objects within the surrounding perceptual field (Levenson, 1972).

Process measures of problem-solving focus on the skills and abilities that enable individuals to solve problems effectively whereas outcome measures focus on either their reported solutions (specific coping responses or techniques) or their actual coping performance. In clinical practice it is important to have different treatment strategies available for the individual who may be good at discovering an effective solution but poor at carrying it out. The first investigation using cognitive outcome measures to compare deliberate self-harmers with non-suicidal controls reported a more rigid thinking style (Neuringer, 1964). This study used impersonal problem-solving tasks. The relationship between impersonal and interpersonal problem-solving characteristics among deliberate self-harm patients was first established when Schotte and Clum (1987) found that hospitalized suicidal psychiatric patients had greater cognitive rigidity than non-suicidal hospitalized psychiatric patients in terms of both impersonal problem solving *and* interpersonal problem solving of personal problems. Suicide ideators and deliberate self-harmers performed significantly poorer on the Alternate Uses Test (Wilson, Christensen, Merrifield, & Guilford, 1975) generating 60% fewer alternative uses than controls, and on a modified version of the Means-Ends Problem-Solving Procedure (Platt, Spivak, & Bloom, 1975) a task requiring participants to list 10 problems they believed led to their hospitalization and to generate up to six potential solutions to the first interpersonal problem on the list. They generated fewer than half as many possible solutions as the controls. Poorer performance by deliberate self-harmers on the MEPS procedure which measures an individual's ability to bring to mind the means of moving towards a specific goal has been replicated in several studies (Howat & Davidson, 2002; Pollock & Williams, 2004). Deliberate self-harm patients have also been found to perform significantly poorer than non-suicidal psychiatric controls on the Optional Thinking Test, for which respondents are provided with a number of interpersonal problems and required to generate all the things a person could do about each of the problems (McLeavey *et al.*, 1987). Optional thinking which involves the generation of alternative solutions to a given problem is distinct from means-ends thinking which involves conceiving of sequential behaviours or steps taken in pursuit of a pre-specified goal. Optional thinking has been found to load on a separate problem-solving factor to means-ends cognition (Platt & Spivak, 1977) and is important in the early phase of responding to problems, prior to means-ends cognition.

To our knowledge only one published study has used an outcome measure of problem-solving ability to examine the association between problem solving and repeated deliberate self-harm. This was a prospective 1-year follow-up study of female deliberate self-harm patients diagnosed with Borderline Personality Disorder (Kehrer & Linehan, 1996) which found that the generation of inappropriate (e.g. substance abuse, lying, aggression towards others, self-harm) and to a lesser extent, passive problem solutions were predictive of *repeated* deliberate self-harm as measured by a modified version of the Means-Ends Problem-Solving procedure (MEPS). However, their findings may be limited to this specific diagnostic group and the sample size was relatively small ($N = 33$). Only one study was found which specifically examined the association between cognitive rigidity and repeated deliberate self-harm. This was a prospective 6-month follow-up study of deliberate self-harm patients, which found no association between cognitive rigidity as measured by the California Psychological Inventory (CPI)

Flexibility Scale (Megargee, 1972) and repeated deliberate self-harm within 6 months, although self-esteem and to a lesser extent hopelessness were found to be associated with repetition (Petrie, Chamberlain, & Clarke, 1988). The sample size ($N = 67$) was relatively limited however of whom only 46 (79%) individuals responded to the follow-up questionnaire. Furthermore, the CPI Flexibility Scale is not an outcome measure of cognitive rigidity. The present study sought to examine whether optional thinking (the generation of solution alternatives to interpersonal problems) and other baseline characteristics were associated with gender, with previous history of deliberate self-harm and with subsequent repetition at one-year follow-up in a sample of patients who presented to hospital with deliberate self-harm. In order to address the possible influence of other important demographic and clinical variables on the association between optional thinking and repeated DSH, we controlled for the effect of gender, age, method of DSH, marital status, education, history of DSH, level of suicide intent, and hopelessness. We also examined the association separately for repeaters and first evers, and for males and females.

Method

Participants

Over the study period (March 2000–November 2001), 307 deliberate self-harm patients presenting to one city hospital Accident and Emergency department were screened. Of these, 111 (36.2%) were ineligible for participation in the study. The principal reasons for the ineligibility were: outside the age range (30, 27.0%), alcohol dependence (19, 17.1%), and psychosis (19, 17.1%). Of the 196 deliberate self-harm patients approached, 152 (77.6%) consented to participate. '*Deliberate self-harm*' was defined according to the definition of parasuicide/attempted suicide devised by the WHO Working Group of the WHO/EURO Multi-centre Study on Suicidal Behavior:

> an act with non-fatal outcome, in which an individual deliberately initiates a non-habitual behavior that, without intervention from others, will cause self-harm, or deliberately ingests a substance in excess of the prescribed or generally recognised therapeutic dosage, and which is aimed at realizing changes which the subject desired via the actual or expected physical consequences (Platt *et al.*, 1992).

This definition includes acts that are interrupted before deliberate self-harm is inflicted, for example, a person removed from a bridge before jumping off, but excludes episodes by individuals who do not understand the meaning or the outcome of their act, for example, due to a learning disability or severe mental disorder (Bille-Brahe *et al.*, 1994). In addition, patients had to meet the following inclusion criteria:

(1) aged between 18 and 64.
(2) no history of psychosis, learning disability, or organic cognitive impairment.
(3) medically fit for assessment.

Consenting patients were assessed by a psychiatric nurse or a research psychologist trained in the assessment procedure using a structured interview schedule, usually within 2 days of their index episode. This assessment was carried out separately from the routine psychosocial assessment by the liaison psychiatrist attached to the Accident and Emergency department. In some cases the psychosocial assessment was carried out prior to the research assessment, while in other cases the research assessment was carried out first.

Based on checks of Accident and Emergency department records at all three acute hospitals in the city, repeaters were identified as patients who had engaged in at least one further deliberate self-harm act at 1-year follow-up. Non-repeaters were those patients whose index act was their only known episode at the time of follow-up.

Design

The study was prospective in design. Each participant was interviewed once at intake to the study to assess baseline characteristics. Repetition within 12 months (the dependent variable) was measured by checking Accident and Emergency hospital records. With the sample being made up of approximately 50 first evers and 100 repeaters, and anticipating a repetition rate of 10–12% among first evers, the sample had 80% power to show that a threefold difference in prospective repetition was statistically significant at the 5% level.

Measures

The Suicide Intent Scale (SIS; Beck, Schuyler, & Herman, 1974) is a 15-item interview schedule that assesses the severity of an individual's wish to die and is administered following an episode of DSH. Items were scored 0, 1, or 2 with a total score range of 0–30. Higher scores indicate more serious suicide intent. The first 8 items examine the physical, objective circumstances of the attempt, while the remaining 7 items address the patient's subjective thoughts about the act itself. Respondents were encouraged to give a narrative of what had happened in as much detail as possible, while the interviewer used the questions as a probe in order to score the scale. The SIS has good internal consistency ($\alpha = .85$; Spirito, Sterling, Donaldson, & Arrigan, 1996).

Hopelessness was assessed using the Beck Hopelessness Scale (Beck, Weissman, Lester, & Trexler, 1974), a 20-item scale with a true/false response format that assesses the extent of an individual's negative expectancies about the future. Items were scored 0 or 1 and half of the items were reverse scored. Total scores range from 0 to 20 with higher scores indicating greater levels of hopelessness. Beck and colleagues reported high internal consistency ($KR - 20 = .93$) and relatively high levels of concurrent and construct validity for the scale.

The Optional Thinking Test (Platt & Spivak, 1977) is an outcome measure of interpersonal problem-solving ability that assesses respondents' capacity to generate alternative possibilities for overcoming real-life interpersonal problems. The following four hypothetical interpersonal problems together with instructions were presented to participants in printed format before being administered verbally by the interviewer:

(1) 'Mary wants to watch her favourite TV programme but her friend is watching another programme. What can Mary do so that she can have a turn watching TV?'
(2) 'Ann wants people to listen to her but no-one ever does. What can Ann do to get listened to?'
(3) 'Nora wants her friend to go to the pictures with her this evening but her friend doesn't want to go. What can Nora do to get her friend to go with her to the pictures this weekend?'
(4) 'Maria broke her husband's favourite flower pot and she's afraid her husband will be mad at her. What can Maria do so her husband won't be mad?'

Participants were asked to generate alternative solutions for solving each problem. Their verbal responses were recorded verbatim by the interviewer on the answer sheets. To facilitate identification with the protagonist, the gender of the protagonist in each story was matched to the respondent's gender. Responses to each problem were scored as one or more relevant options, or as an irrelevant option, or a no option. All relevant problem options were summed to provide a single total score. A relevancy ratio was also calculated, by dividing the total number of relevant options by the total number of responses given by the participant (including relevant options, irrelevant options and responses that provide no options). Optional thinking has been found to have satisfactory discriminant and concurrent validity (Spivak, Platt, & Shure, 1976).

Statistical analysis

Descriptive statistics were used to describe the characteristics of the sample. Scale scores for optional thinking (number of relevant options and relevancy ratio) and for suicide intent were collapsed into tertiles to represent subjects with low, medium, and high scores. Hopelessness scores were divided into three subgroups using the score cut-offs recommended by Beck *et al.* (1974) and collapsing the bottom two categories (minimal/mild) because of the limited numbers in each of them. Chi-squared tests assessed whether optional thinking and other baseline characteristics were associated with gender, previous history of deliberate self-harm, and subsequent repetition. Logistic regression was used to further examine the association between baseline characteristics and subsequent repeated deliberate self-harm. First, models were estimated with one independent/predictor variable. Then, a multivariate model was estimated to examine the independent associations. Finally, we assessed whether there was evidence of an association between optional thinking and repetition in men and women and in first evers and repeaters.

To assess inter-rater reliability of the Optional Thinking Test scores, 20% ($N = 35$) were scored by a second independent rater, blind to the repeater status of participants, by taking every fifth response form. The kappa-coefficient (Cohen, 1960) was used as a measure of inter-rater reliability. The cut-off points used for kappa values were the following: $\geq .75$ = excellent; .65 – .74 = good; .50 – .64 = fair; .40 – .49 = moderate; $< .40$ = poor.

Results

Interviewed study sample compared with the hospital-treated population of DSH patients

The vast majority of participants (85%) were interviewed within 2 days of their index episode. Table 1 compares the interviewed study sample with the population of DSH patients presenting to the same hospital in 2001 (National Suicide Research Foundation, 2002), with regard to three variables: gender, age, and method. In comparison with the total DSH population, the interviewed sample was somewhat more likely to have used self-poisoning only as a method of DSH although this difference was not statistically significant ($p = .088$).

Additional demographic and clinical characteristics of the interviewed study sample are shown in Table 1. The majority of those interviewed were not married (84.7%) and did not have a third-level education (81.4%). Almost two-thirds (63.1%) of those interviewed had a history of DSH. At 12-month follow-up, just over one-in-five (20.4%)

Table 1. Characteristics of the interviewed study sample compared with the population of DSH patients

		Sample		All DSH patients[a]	
Variable	Category	N	(%)	N	(%)
Gender	Male	57	37.5	98	39.5
	Female	95	62.5	150	60.5
Age	18–23 years	52	34.2	74	30.1
	24–33 years	50	32.9	76	30.9
	34 years +	50	32.9	96	39
Method of self-harm	Self-poisoning only	124	81.6	184	74.2
	Other	28	18.4	64	25.8
Marital status	Married	23	15.3		
	Not married	127	84.7		
Education	Low	11	7.6		
	Medium	107	73.8		
	High	27	18.6		
History of self-harm	No	55	36.9		
	Yes	94	63.1		
Repeated self-harm	No	121	79.6		
	Yes	31	20.4		
		Mean	SD		
Relevant options	Relevancy ratio	0.67	0.30		
Relevant options	Number of options	3.9	2.62		
Suicide intent		12.8	6.63		
Hopelessness		10.7	5.73		

[a] All deliberate self-harm patients who presented to Cork University Hospital in 2001.

had a hospital-treated repeated DSH episode. The mean hopelessness score was 10.7 ($SD = 5.73$), while the mean suicide intent score was 12.8 ($SD = 6.63$). The mean number of relevant options generated was 3.9 ($SD = 2.62$) while the mean relevancy ratio was 0.67 ($SD = 0.30$).

Inter-rater reliability

Inter-rater reliability on the number of relevant options was excellent overall ($\kappa = 0.75$, Agreement 84%). However, there was considerable variation among the four stories with κ-values ranging from excellent to fair to good (Story 1 $\kappa = 0.90$, Story 2 $\kappa = 0.52$, Story 3 $\kappa = 0.67$, Story 4 $\kappa = 0.85$).

Gender differences

The baseline characteristics are compared for males and females in Table 2. Compared with females, males were significantly older (Chi – squared for trend $= 5.74$, $df = 1$, $p = .017$). A significantly larger proportion of the females were married ($\chi^2 = 7.18$, $df = 1$, $p = .007$) and had achieved a higher level of education (Chi – squared for trend $= 4.29$, $df = 1$, $p = .038$). At baseline assessment there was a similar proportion of repeaters in each gender group.

Table 2. Between-group differences by gender and repeater status at baseline

		Gender (%)		Previous history of DSH (%)	
Variable	Category	Men ($N = 57$)	Women ($N = 95$)	Yes ($N = 94$)	No ($N = 55$)
Gender	Male	–	–	37.2	36.4
	Female	–	–	62.8	63.6
Age	18–23 years	24.6	40.0	27.7	47.3
	24–33 years	31.6	33.7	34.0	30.9
	34 years +	43.9	26.3	38.3	21.8
Method of self-harm	Self-poisoning only	75.4	85.3	77.7	89.1
	Other	24.6	14.7	22.3	10.9
Marital status	Married	5.3	21.5	19.4	7.4
	Not married	94.7	78.5	80.6	92.6
Education	Low	14.5	3.3	9.1	5.6
	Medium	70.9	75.6	69.3	79.6
	High	14.5	21.1	21.6	14.8
History of self-harm	No	36.4	37.2	–	–
	Yes	63.6	62.8	–	–
Repeated DSH	No	77.2	81.1	71.3	92.7
	Yes	22.8	18.9	28.7	7.3
Relevancy ratio	Low	29.1	30.9	28.6	32.7
	Medium	38.2	27.7	38.5	20.0
	High	32.7	41.5	33.0	47.3
No. relevant options	Low	36.4	31.9	36.3	29.1
	Medium	32.7	30.9	34.1	27.3
	High	30.9	37.2	29.7	43.6
Suicide intent	Low	26.8	33.7	25.6	38.2
	Moderate	28.6	35.9	31.1	38.2
	High	44.6	30.4	43.3	23.6
Hopelessness	Minimal/mild	38.9	39.3	31.1	52.9
	Moderate	35.2	30.3	32.2	31.4
	Severe	25.9	30.3	36.7	15.7

Retrospective repetition (repeaters vs. first evers)

The baseline characteristics are compared for repeaters and first evers in Table 2. The proportion of repeaters who engaged in further DSH was four times that of first evers ($\chi^2 = 9.69$, $df = 1$, $p = .002$). There was significant evidence of a trend in the associations between history of DSH and age (Chi-squared for trend = 6.70, $df = 1$, $p = .010$), suicide intent (Chi-squared for trend = 5.38, $df = 1$, $p = .020$) and hopelessness (Chi-squared for trend = 8.83, $df = 1$, $p = .003$). In each case, having a history of DSH was associated with increased age and levels of suicide intent and hopelessness. The strength of the associations between previous history of DSH and method of DSH ($\chi^2 = 3.06$, $df = 1$, $p = .080$), marital status ($\chi^2 = 3.83$, $df = 1$, $p = .050$), and relevancy ratio ($\chi^2 = 5.73$, $df = 2$, $p = .057$) just failed to reach statistical significance. A lower proportion of those with a history of deliberate self-harm used self-poisoning only, were not married, and scored high on the relevancy ratio.

Prospective repetition (repeaters vs. non-repeaters)

For each of the baseline characteristics, Table 3 presents the proportions of the sample that did and did not repeat DSH within 12 months. With regard to optional thinking, there were fewer repeaters among the high scoring participants than among the low and moderate scorers. However, the association was not statistically significant for relevancy ratio ($p = .169$) or for number of options ($p = .301$). There was significant evidence of an association between age and repetition whereby the risk of repetition increased with age (Chi-squared for trend = 6.50, $df = 1$, $p = .011$). There was also a trend in the association between education and repetition, whereby increased education protected against repetition (Chi-squared for trend = 4.71, $df = 1$, $p = .030$). Significantly more people with a history of DSH at their index episode repeated compared with those who did not have a history (28.7% vs. 7.3%, $\chi^2 = 9.69, df = 1, p = .002$). A significantly larger proportion of those with a high score on the SIS repeated ($\chi^2 = 8.82$, $df = 2$, $p = .012$).

Both scores on the Optional Thinking Test together with gender, age, method of DSH, marital status, education, history of DSH, level of suicide intent, and hopelessness were entered as predictor variables in a multiple logistic regression analysis with repetition (one or more repeated episodes within 12 months) as the dependent variable. History of DSH was significantly associated with prospective repetition when considered alongside all the other predictor variables. Age was significantly (though more weakly) associated with repetition when considered on its own but was no longer significant when the other predictor variables were included. A Hosmer and Lemeshow test supported the fit of the multivariate models including the relevancy ratio ($\chi^2 = 8.89$, $df = 8$, $p = .352$) and the number of relevant options ($\chi^2 = 14.05$, $df = 8$, $p = .08$).

Among those with no history of deliberate self-harm, scores in the lower 50th percentile of both the number of relevant options and of the relevancy ratio were associated with a significantly increased risk of repetition ($\chi^2 = 6.47$, $df = 1$, $p = .011$ and $\chi^2 = 6.00$, $df = 1$, $p = .014$, respectively). Among those with a previous history of DSH at intake, there was no evidence of an association between optional thinking ability and further repetition of DSH within 12 months, when scores in the lower 50th percentile of both the number of relevant options or of the relevancy ratio were examined ($p = .841$ and $p = .642$, respectively).

Association between optional thinking and repetition by gender and by repeater status

Chi-squared tests showed no evidence that either measure of optional thinking (number of relevant means or relevancy ratio) was associated with prospective repetition when examined separately for men ($p = .132$ and $p = .104$, respectively) and women ($p = .928$ and $p = .663$, respectively). Similarly there was no evidence of an association for those with a previous history of DSH ($p = .571$ and $p = .607$, respectively). However, among first evers it was indicated that level of optional thinking in terms of relevancy ratio was associated with repetition ($\chi^2 = 8.87$, $df = 2$, $p = .012$). Out of the 18 first evers with low scores on relevancy ratio, 4 (22%) repeated compared with none of the 37 first evers scoring medium or high. Despite the limited numbers in these analyses, this finding indicates that optional thinking may be protective against repetition, but only among those who have not previously self-harmed. Figure 1 illustrates the differential association between optional thinking (relevancy ratio) and repetition for repeaters and first evers. This association is contrasted with the lack of

Table 3. The association between baseline characteristics of patients and their repetition of self-harm within 1 year

		Repetition at 1 year					
Variable	Category	Yes (%; $N = 31$)	No (%; $N = 121$)	OR[a]	95% CI	OR[b]	95% CI
Gender	Male (ref. group)	22.8	77.2	1.00	–	1.00	–
	Female	18.9	81.1	0.79	0.35–1.77	1.15	0.37–3.56
Age	18–23 years (ref. group)	7.7	92.3	1.00	–	1.00	–
	24–33 years	26.0	74.0	4.22*	1.27–14.00	2.46	0.60–10.08
	34 years +	28.0	72.0	4.67*	1.42–15.37	1.86	0.38–9.23
Method of self-harm	Self-poisoning only (ref. group)	21.8	78.2	1.00	–	1.00	–
	Other	14.3	85.7	0.60	0.19–1.88	0.98	0.24–4.04
Marital status	Married	30.4	69.6	1.88	0.70–5.07	1.29	0.30–5.49
	Not married (ref. group)	18.9	81.1	1.00	–	1.00	–
Education	Low (ref. group)	45.5	54.5	1.00	–	1.00	–
	Medium	20.6	79.4	0.31	0.09–1.11	0.22	0.04–1.36
	High	11.1	88.9	0.15	0.03–0.81	0.08	0.01–0.81
History of self-harm	No (ref. group)	7.3	92.7	1.00	–	1.00	–
	Yes	28.7	71.3	5.14**	1.69–15.61	4.06*	1.02–16.21
Relevancy ratio	Low	24.4	75.6	2.31	0.81–6.56	2.16	0.55–8.50
	Medium	25.5	74.5	2.45	0.88–6.84	2.59	0.71–9.50
	High (ref. group)	12.3	87.7	1.00	–	1.00	–
No. of relevant options	Low	22.0	78.0	1.81	0.64–5.13	1.28[c]	0.32–5.05
	Medium	25.5	74.5	2.20	0.79–6.18	2.44[c]	0.67–8.92
	High (ref. group)	13.5	86.5	1.00	–	1.00	–
Suicide intent	Low (ref. group)	21.7	78.3	1.00	–	1.00	–
	Moderate	8.2	91.8	0.32	0.09–1.11	0.35	0.07–1.74
	High	32.1	67.9	1.70	0.69–4.21	2.44	0.64–9.40
Hopelessness	Minimal/mild (ref. group)	17.9	82.1	1.00	–	1.00	–
	Moderate	17.4	82.6	0.97	0.35–2.70	0.72	0.19–2.80
	Severe range	29.3	70.7	1.90	0.73–4.97	0.83	0.22–3.10

[a] Odds ratios estimated by logistic regression models including one independent variable.

[b] Odds ratios estimated by the multivariate logistic regression model with all variables including the relevancy ratio but not the number of relevant options.

[c] Odds ratios estimated by the multivariate logistic regression model with all variables including the number of relevant options but not the relevancy ratio.

*$p < 0.0$; **$p < 0.01$.

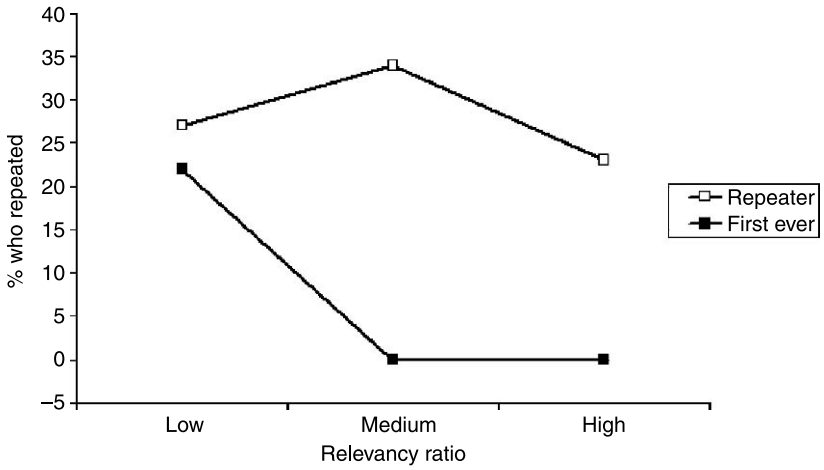

Figure 1. Association between optional thinking and prospective repetition by repeater status.

association among repeaters in Figure 1. It can be seen that a similar proportion of first evers and repeaters with low relevancy ratio scores engaged in further DSH. Increased optional thinking was associated with reduced repetition in the first evers but showed no impact on repetition in those with a previous history. A similar pattern was found when number of relevant options was examined.

Discussion

Among patients presenting with a first deliberate self-harm episode in the present study, poorer optional thinking ability on interpersonal problems was associated with an increased risk of repeated deliberate self-harm within 1 year. In other words, those with no previous deliberate self-harm, who have difficulty in generating alternative solutions to problems, may be more likely to engage in further DSH within 1 year of an index episode. Among first evers, the association between optional thinking and repetition at follow-up was significant for both the relevancy ratio and the number of relevant options. The association between optional thinking ability and further deliberate self-harm was not significant for those with a previous history of deliberate self-harm. Those with a history of DSH at their index episode were significantly more likely to have repeated by 12-month follow-up (four times as many repeaters engaged in a further DSH episode) and this association was independent of all the other variables, including optional thinking, levels of hopelessness, and suicide intent. A previous DSH episode is the most important risk factor for repeated deliberate self-harm and has been well documented (Buglass & Horton, 1974; Kerkhof & Arensman, 2004; Owens, Dennis, Read, & Davis, 1994). In addition, significantly larger proportions of those in the older age groups, of those with a lower level of education, and of those with higher levels of suicide intent repeated during follow-up; however, these associations were not independent of the effects of the other variables.

Optional thinking difficulties may contribute to the onset or initiation of deliberate self-harming behaviour as distinct from the maintenance of a deliberate self-harming behavioural pattern. There is evidence to suggest that different problem-solving skills are involved in these two processes (Kehrer & Linehan, 1996; Linehan *et al.*, 1987). One earlier study found that active interpersonal problem solving was significantly poorer in

deliberate self-harmers without a previous history of DSH compared with suicide ideators (Linehan *et al.*, 1987), while a subsequent study of patients diagnosed with Borderline Personality Disorder with a minimum of two previous episodes of DSH found that the generation of inappropriate problem-solving solutions (lying, substance abuse, aggression towards others, DSH) was predictive of repeated deliberate self-harm (Kehrer & Linehan, 1996). In the present study, there was no association between optional thinking and further repeated episodes of deliberate self-harm among those who had a previous history, providing further evidence that separate factors are associated with first ever and repeated DSH episodes (Slee, Arensman, Garnefski, & Spinhoven, 2007).

There was a lack of gender differences in the present study with the exceptions that males were significantly older and a significantly larger proportion of females were married. At baseline there was a similar proportion of first evers and repeaters in each gender group; and similar proportions of men and women had repeated during the follow-up period.

The present findings are reasonably generalizable, to the extent that the interviewed study sample did not differ significantly with regard to gender, age, or method, from the total number of deliberate self-harm patients who presented to the same hospital during one of the calendar years in which the study was carried out. For the study sample, the average level of suicide intent and the average hopelessness score fell within the moderate range.

The choice of an 'outcome' as opposed to a 'process' measure of social problem solving in the present study is important. As an outcome measure, the Optional Thinking Test assesses problem-solving performance, requiring participants to simulate real-life problem-solving behaviour, and, therefore, has greater external validity (D'Zurilla & Maydeu-Olivares, 1995). The average number of relevant options generated by the sample in the present study was similar to that reported by McLeavey *et al.* (1987) in a previous study of DSH patients, which suggests that the Optional Thinking Test is a reliable measure of problem-solving ability in this population.

The present study suffered from a number of limitations: the sample size was limited in its power to test the association between optional thinking ability and prospective repetition. No first evers with moderate or high relevancy ratio scores on optional thinking repeated. The interviewed sample had a large proportion of individuals with a lifetime history of deliberate self-harm (almost two-thirds) which would have been greater than the proportion in the overall DSH population, as earlier work in the same research centre showed that approximately half of the DSH population are repeaters (Corcoran, Keeley, O' Sullivan, & Perry, 2004). The inter-rater reliability of the Optional Thinking Test used in the present study showed considerable variation between stories. One of the stories used ('Ann wants people to listen to her but no one ever does. What can Ann do to get listened to?') was more ambiguous than the other three stories and had only fair inter-rater reliability. Reliance purely on hospital Accident and Emergency records to establish repetition meant that a number of individuals categorized as 'non-repeaters' in our study were likely to have repeated during follow-up without representing to one of the city hospitals. Identification of repeaters based on hospital records alone has previously been found to lead to an underestimated rate of repetition (Guthrie *et al.*, 2001).

Clinical implications

The present study findings indicate that for those presenting with a first DSH episode, techniques to enhance optional thinking in interpersonal problem solving are likely to

be important in preventing repeated episodes but once deliberate self-harm is repeated, optional thinking ability may be less important as a single factor in determining outcome. A second important clinical implication is that interventions, such as interpersonal problem-solving skills training, for first episode self-harmers should be delivered as soon as possible following presentation to pre-empt the establishment of deliberate self-harm as an automatic response to stress. This is an important challenge for the organization of services delivering treatment interventions to those who deliberately self-harm (Sakinofsky, 2000; Tyrer *et al.*, 2003).

Recommendations for future research

The present study has shown that optional thinking in interpersonal problem solving is associated with risk of future repeated deliberate self-harm in those with a first episode. In comparison with the large number of process measures of problem-solving ability available, there is a general dearth of outcome measures to assess interpersonal problem-solving skills. Future investigations should compare the relative contributions of different types of problem-solving measures (e.g. process vs. outcome measures) and different types of problem-solving skill (e.g. means-ends thinking vs. optional thinking) to the prediction of repeated deliberate self-harm. Repetition during follow-up should be based not only on hospital records but also on a self-report measure of repeat acts of deliberate self-harm, whether hospital treated or not.

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