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Chapter 5

Mediating effects of coping style on associations between psychological factors and self-harm among adolescents

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ABSTRACT

There is evidence for an association between suicidal behaviour and coping style among adolescents. The aims of this study were to examine associations between coping style, mental health factors and self-harm thoughts and acts among Irish adolescents, and to investigate whether coping style mediates associations between mental health factors (depression, anxiety and self-esteem) and self-harm.

A cross-sectional school-based survey was carried out. Information was obtained on history of self-harm, life events, demographic, psychological and lifestyle factors.

Emotion-oriented coping was strongly associated with poorer mental health and self-harm thoughts and acts, while problem-oriented coping was associated with better mental health. A mediating effect of emotion-oriented coping on associations between mental health factors and DSH was found for both genders and between problem-oriented coping and mental health factors for girls. Similar mediating effects of coping style were found when risk of self-harm thoughts was examined.

Mediating effects of coping style on associations between psychological factors and self-harm among adolescents

INTRODUCTION

Deliberate self-harm (DSH) is recognised worldwide as a major public health problem, with a wide ranging impact on the individual, their family, and health services. Lifetime prevalence of DSH among adolescent girls ranges from 5.7% (The Netherlands) to 17% (Australia) compared with 2.4% (The Netherlands) to 6.5% (Belgium) among boys (Madge et al., 2008). The school-based CASE study (Child and Adolescent Self-harm in Europe), on which this study is based, reported that 9.1% of Irish adolescents (13.9% of girls and 4.3% of boys) surveyed had harmed themselves at some point, of whom just under half reported repeated episodes (Morey *et al.*, 2008).

A growing number of population-based studies have examined various factors potentially associated with self-harm among young people, including coping style and problem-solving deficits. Coping can be defined as the cognitive and behavioural activities by which a person attempts to manage specific stressful situations, as well as the emotions that they generate (Lazarus and Folkman, 1984). Based on this general definition, problem solving is one type of coping process. For any examination of coping among adolescents, it is important to note that coping methods and resources are specific to the individual's developmental level (Compas *et al.*, 2001) and that changes in coping style over time are a normal part of adolescent development (Oldershaw et al., 2009). However, the development of characteristic ways of coping in childhood and adolescence may be precursors to patterns of coping in adulthood (Compas et al., 2001).

Studies which have examined the relationship between DSH and problem solving or coping among adolescents vary significantly in how they define DSH. Also, a wide range of problem-solving, problem-orientation and coping measures have been used, including process measures

which assess strengths and deficits in problem-solving attitudes and skills and outcome measures which evaluate problem-solving performance (D'Zurilla and Maydeu-Olivares, 1995). However, despite inconsistencies across studies, there is evidence for an association between suicidal behaviour and problem-solving deficits in adolescents (Speckens and Hawton, 2005).

A study of Irish university students reported that those with suicidal thoughts had significantly poorer problem-solving scores than those without (McAuliffe *et al.*, 2003). Reporting findings of the multi-centre CASE study, Portzky et al (2007) found that emotion-oriented coping was associated with deliberate self-harm in a sample of Dutch and Belgian adolescents (Portzky *et al.*, 2007). However, this was not an independent association. An Australian study found that coping by self blame was associated with DSH (De Leo and Heller, 2004), while a Hungarian study reported that ineffective coping strategies were associated with DSH among adolescents (Voros *et al.*, 2005). The English CASE study investigators reported that adolescents with a history of DSH reported more coping methods considered to be "emotion-focused", while those without DSH were more likely to report "problem-focused" approaches (Evans *et al.*, 2005). Problem-focused approaches or active coping strategies, involving seeking help and advice, have been reported to be associated with positive adjustment among adolescents (Schonert-Reichl *et al.*, 1995).

It has been argued that research in this field has not adequately incorporated mediating and moderating variables into pathways linking psycho-social factors and suicidal behaviour (Sandin *et al.*, 1998). A variable may be called a mediator to the extent that it accounts for or explains the relation between the predictor and the criterion. On the other hand, moderators are variables which influence the strength and/or direction of the relation between the predictor and criterion (Baron & Kenny, 1986). Recently, theoretical models of the development of suicidal behaviour in adolescents have explicitly included mediating/moderating variables including problem solving (O'Connor, 2011). Although depression (Hawton *et al.*, 1999) and self-esteem (McAuliffe et al., 2006) have been found to mediate or moderate associations between DSH

and coping style, no studies have specifically examined the mediating effect of coping styles on the established associations between psychological difficulties and self-harm thoughts or acts in adolescents. Adolescents at high risk of suicidal behaviour have been found to hold attitudes that support the use of maladaptive coping strategies in response to depression, suicidal thoughts and behaviours (Gould et al., 2004), but these associations need to be further investigated.

Positive coping skills have been associated with resilience, which can be defined as positive outcomes in the presence of adversity (Campbell-Sills *et al.*, 2006) and which involves a focus on individuals' strengths as well as deficits (Luthar *et al.*, 2000). In the context of coping, resilience can be thought of as the successful outcome of coping processes (Compas et al., 2001). It has been suggested that adolescents' wellbeing can be improved if they are helped to minimize their use of negative avoidant coping strategies and to increase their use of active coping (Frydenberg and Lewis, 2009). Helping young people to adopt more positive coping strategies may also reduce their risk of developing depressive symptoms, which are strongly associated with suicidal thoughts and behaviours (Sawyer *et al.*, 2009). As a wide range of interventions for the treatment and prevention of psychopathology are designed to enhance coping skills of adolescents (Compas et al., 2001), greater knowledge of the coping strategies employed by adolescents can inform these interventions. In order to optimise the teaching of positive coping skills to adolescents in the school setting, it is important first to identify the possible associations between coping style and DSH and related mental health difficulties in this group.

Our school-based study aimed to examine the associations between coping style, mental health factors and self-harm, using a standardised methodology. The objectives were:

1. To examine coping styles in a sample of Irish adolescents, and to compare males' and females' coping styles.

2. To examine associations between coping style and mental health factors, self-harm thoughts and self-harm acts.
3. To examine whether coping style mediates the association between mental health difficulties including depression, anxiety and self-esteem, and self-harm thoughts and DSH.

METHOD

Design and participants

The study was conducted using a cross-sectional design, with data gathered in 39 schools in counties Cork and Kerry in Ireland. The questionnaire was administered and completed by students in a class setting with a member of the research team present. The study design, procedure and sample have been more fully described elsewhere (McMahon *et al.*, 2010, Morey *et al.*, 2008).

Measures

The survey in Ireland was part of the multi-centre CASE study (Madge *et al*, 2008). A standardized, internationally validated, anonymous questionnaire was designed by the CASE collaborators and used for data collection by each of the seven centres involved in the study (six centres in Europe and one in Australia). The questionnaire comprised a wide range of variables, including demographic variables, lifestyle factors and questions about deliberate self-harm and self-harm thoughts.

Coping scale: The brief coping scale used in the CASE survey was designed by the CASE investigators based on existing coping measures (Endler and Parker, 1990) and was formulated to address the relevant research questions related to adolescent mental health. Participants were asked how frequently (never/sometimes/often) they did the following when they were worried

or upset: *(1) talked to someone; (2) blamed themselves for getting into the mess; (3) got angry; (4) stayed in their room; (5) thought about how they had dealt with similar situations; (6) had an alcohol drink; (7) tried not to think about what was worrying them; (8) tried to sort things out.*

The questionnaire also included three validated psychological scales. Depressive symptoms and anxiety were measured using the Hospital Anxiety and Depression Scale (HADS), which has been validated for use with an adolescent population (White *et al.*, 1999). Impulsivity was measured using six items from the Plutchik impulsivity scale (Plutchik *et al.*, 1989). Self-esteem was measured using an eight-item version of the Self-Concept Scale (Robson, 1989). Strong convergent and discriminant validation of the scale has been reported (Addeo *et al.*, 1994). All three scales were found to have high internal consistency in our sample (McMahon et al., 2010).

An important aspect of the study methodology was that participants who reported self-harm were asked to describe, in their own words, the method(s) they had used to harm themselves. This description was later coded according to a standardised definition of deliberate self-harm: *"An act with non-fatal outcome in which an individual deliberately did one or more of the following: initiated behaviour (for example, self cutting, jumping from a height), which was intended to cause self-harm; ingested a substance in excess of the prescribed or generally recognisable therapeutic dose; ingested a recreational or illicit drug that was an act that the person regarded as self-harm; or ingested a non-ingestible substance or object"* (Madge et al., 2008). Episodes of deliberate self-harm were classified as a 'yes', 'no' or 'no information given' by three independent raters using the standardised definition above (Cohen's Kappa = 0.77). When participants reported that they had harmed themselves in the past but did not describe the act, they were classified "no information given" and were not included as a DSH case. The definition used allowed for the inclusion of a wide range of motives and levels of

suicidal intent. Self-harm thoughts were defined as having thoughts of harming oneself without acting on them on that occasion.

Statistical Analyses

Principal component analysis using varimax rotation was used to investigate the number of factors represented by the 8 items of the coping scale. Principal component analysis is a simple, non-parametric method which uses an orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of uncorrelated variables called principal components. This approach is useful as it allows us to reduce a complex dataset to lower dimensions and reveal a more simplified structure which may underlie it.

To investigate associations between gender and coping style, boys and girls were compared using t-tests. The effect size was measured using partial Eta^2 and, following established guidelines (Cohen, 1988), the effect size was considered very small if partial $Eta^2<0.01$, small if <0.06, medium if <0.14 and large if 0.14+. Analyses were carried out separately for boys and girls.

Pearson's correlation coefficient, *r*, was used to assess the strength of the linear association between the psychological measures (depressive symptoms, anxiety and self-esteem) and coping style measures. Subgroups of adolescents were compared in terms of coping style using one-way ANOVA and post-hoc tests (Tukey's Honestly Significant Difference).

The hypothesis that the associations between psychological factors and self-harm thoughts and DSH would be mediated by coping style was tested in accordance with the approach advocated by Baron and Kenny (Baron and Kenny, 1986), involving four stages. First, the independent variable (in this case level of depressive symptoms, anxiety or self-esteem) should predict change in the outcome (eg DSH). This analysis has been carried out previously on this sample

and significant associations reported (McMahon et al., 2010). Secondly, the independent variable (psychological factor) should predict change in the proposed mediator (coping style) (see Table 3). Thirdly, change in the mediator should be significantly associated with change in the outcome (eg DSH) (see "Associations between self-harm thoughts and acts"). Finally, the effect of the independent variable on change in the outcome should be attenuated when change in the mediator is statistically controlled (Table 5). Regression analyses were used to perform this final step (investigation of potential mediation effects). Odds ratios and 95% confidence intervals were calculated for lifetime history of DSH. Initially, each psychological variable was entered separately as the independent variable with lifetime history of DSH as the dependent variable (method=enter). The regression analyses were replicated with problem-oriented coping score as a covariate and again with emotion-oriented coping as a covariate. Full mediation is said to occur when this latter effect drops to zero, partial mediation is said to occur when the effect diminishes, but remains significant. In the case of partial mediation, a further test was required to establish whether the indirect effect of the independent variable on the dependent variable via the mediator was significant. Because of the dichotomous dependent variable, the stages described above included a mixture of linear and logistic regression analyses which give rise to coefficients on different scales thereby making standard mediation analysis (e.g. Sobel tests) inappropriate. We used Hayes' mediation analysis which allows for dichotomous dependent variables (Preacher and Hayes, 2008). This provides an estimate of the indirect effect of the independent variable on the dependent variable via the mediator and its standard error based on re-sampling. We referred the quotient of these (i.e. indirect effect coefficient divided by standard error) to the standard Normal distribution to estimate its statistical significance which we report. This analysis was repeated with self-harm thoughts as the dependent variable for a subgroup of the sample with no history of DSH. Problems with multi-collinearity were not anticipated as the coping style variables which were correlated with the outcome measure did not show high mutual correlations.

Sample

39 schools took part in the study. Of the 4,583 students invited to complete the questionnaire, 3,881 participated in the survey (85% response rate). 197 questionnaires were disregarded for the purposes of the current study as age criteria were not met, gender was missing, the survey was not completed seriously or questions regarding coping style were not answered in full, giving a total of 3,684 valid surveys. Fifty two percent of the participants were girls and the majority (53.1%) of students were 16 years old.

RESULTS

Principal component analysis

We undertook exploratory data analysis of the eight-item coping scale on the entire sample using principal component analysis. Varimax rotation was used with a cut-off of 0.4, revealing two components (Table 1). One item in the scale did not load on either component and so has been excluded from the analyses. The two components can be referred to as *Emotion-oriented coping* and *Problem-oriented coping*. The first factor, *Emotion- oriented coping,* accounted for 20.6% of the variance explained and the second factor, *Problem-oriented coping*, accounted for 17.8% (38.4% in total). This distinction between Problem-focused and Emotion-focused coping dimensions was supported by the literature on coping in general (Folkman and Lazarus, 1980) and adolescent coping specifically (Compas *et al.*, 1996), and has been employed by other CASE study researchers (Portzky et al., 2007).

Table 1. Principal component analysis: 8-item coping scale

	Component	
	1 Emotion-oriented coping	2 Problem-oriented coping
How often do you blame yourself for getting into the mess?	0.684	
How often do you get angry?	0.682	
How often do you stay in your room?	0.639	
How often do you have an alcoholic drink?	0.437	
How often do you try to sort things out?		0.720
How often do you talk to someone?		0.650
How often do you think about how you have dealt with similar situations?		0.640
How often do you try not to think about what is worrying you?	-	-

Internal consistency of the two sub-scales was examined. Cronbach's alphas for the scales were 0.47 for the *Emotion-oriented* scale and 0.45 for the *Problem-oriented* scale. Low Cronbach's alphas such as these are common in scales with few items (Pallant, 2007), and for this reason we also report inter-item correlations, which were 0.18 for the *Emotion-oriented* scale and 0.22 for the *Problem-oriented* scale. These correlations fall just below and within the recommended optimal range of 0.2-0.4 for scales of this type (Briggs and Cheek, 1986). Subsequent analyses were carried out using the *Emotion-oriented* subscale (scored between a minimum of 4 and maximum of 12) and the *Problem-oriented* subscale (scored between a minimum of 3 and a maximum of 9).

Coping style and gender

Table 2 shows the mean and 95% confidence intervals for scores on both coping scales for girls and boys. Higher scores on the scales indicate more frequent use of each type of coping. Girls reported significantly more frequent use of both coping styles than boys. Gender differences were small but significant for both scales.

Table 2. Scores on coping sub-scales by gender

	Total sample (n=3684)		**Girls (n=1857)**		**Boys (n=1827)**			
	Mean	**95% CI**	**Mean**	**95% CI**	**Mean**	**95% CI**	**Partial Eta^2**	**p-value**
Emotion-oriented coping	7.6	7.50-7.61	7.9	7.81-7.96	7.2	7.14-7.29	0.041*	p<0.001
Problem-oriented coping	6.1	6.07-6.15	6.3	6.21-6.33	5.9	5.89-6.01	0.016*	p<0.001

* Effect size was considered very small if partial Eta^2<0.01, small if <0.06, medium if <0.14 and large if 0.14+(Cohen, 1988)

Associations between coping style and mental health difficulties

Problem-oriented coping was associated with significantly lower levels of depressive symptoms, lower levels of anxiety and higher self-esteem in the total sample (Table 3). *Emotion-oriented coping* was associated with significantly higher levels of depressive symptoms and anxiety and poorer self-esteem. For the total sample, there was a strong positive correlation between *Emotion-oriented coping* and anxiety (r=0.493), a moderately strong positive association between *Emotion-oriented coping* and depressive symptoms (r=0.360) and a strong negative correlation between *Emotion-oriented coping* and self-esteem (r=-0.468). For the total sample, correlations between *Problem-oriented coping* and depression and self-esteem were significant but weak (r=-0.185 and r= 0.201 respectively). The correlation between *Problem-oriented coping* and anxiety was significant among girls but non-significant among boys and among the total sample.

Table 3. Correlations (Pearson's *r*) between scores on coping subscales and levels of depressive symptoms, anxiety and self-esteem[a]

	Problem-oriented coping			**Emotion-oriented coping**		
	Girls	**Boys**	**Total Sample**	**Girls**	**Boys**	**Total Sample**
Depressive symptoms	-0.239*	-0.144*	-0.185*	0.419*	0.290*	0.360*
Anxiety	-0.134*	-0.034[†]	-0.052[††]	0.485*	0.449*	0.493*
Self-esteem	0.286*	0.176*	0.201*	-0.511*	-0.371*	-0.468*

* p<0.001

[†]p=0.114

[††]p=0.002

[a]Correlation is considered small if r=0.1 − 0.23, medium if r = 0.24 − 0.36 and large if r = 0.37 or larger.

Associations between coping style and self-harm thoughts and acts

Those adolescents who reported a lifetime history of DSH differed significantly from those without a history of DSH in terms of both *emotion-oriented coping* and *problem-oriented coping* ($p<0.0005$ for both genders on both coping scales). Those with a history of DSH reported more frequent use of *emotion-oriented coping* and less frequent use of *problem-oriented coping*.

In order to further examine potential associations between coping style and self-harm thoughts and acts, three subgroups of young people were identified within the sample: those who reported no self-harm (lifetime history) and no self-harm thoughts; those who reported self-harm thoughts but no self-harm and those who reported at least one episode of self-harm. There were differences between the three subgroups in terms of scores on both coping subscales (one-way ANOVA, $p<0.0005$ for both scales for both genders). Post hoc tests (Tukey's HSD) were performed to compare the subgroups in terms of both scales (Table 4). There was a trend amongst both girls and boys for higher scores on *emotion-oriented coping* and lower scores on *problem-oriented coping* across the three subgroups in order of increasing severity from no self-harm thoughts or acts to history of self-harm. The largest differences in terms of coping were between those with no thoughts or acts of self-harm and those with self-harm thoughts only ($p<0.0005$ for both coping scales for both genders). The difference between those with self-harm thoughts only and those with acts of self-harm reached statistical significance for girls on both coping scales but was not significant for boys on either scale.

Table 4. Comparison of adolescents with and without self-harm thoughts and acts in terms of scores on coping scales

	Boys					**Girls**				
	1. No self-harm thoughts or acts (n=1471)		**2. Self-harm thoughts only (n=168)**		**3. History of self-harm(n=75)**	**1. No self-harm thoughts or acts (n=1180)**		**2. Self-harm thoughts only (n=334)**		**3. History of self-harm (n=242)**
	Mean [SD]	p-value (group 1/ group 2)	Mean [SD]	p-value (group 2/ group 3)	Mean [SD]	Mean [SD]	p-value (group 1/ group 2)	Mean [SD]	p-value (group 2/ group 3)	Mean [SD]
Emotion-oriented coping	7.00 [1.50]	p<0.001	8.25 [1.81]	p=0.07	8.72 [1.64]	7.36 [1.44]	p<0.001	8.66 [1.47]	p=0.001	9.12 [1.47]
Problem-oriented coping	6.02 [1.24]	p=0.002	5.68 [1.22]	p=0.855	5.59 [1.37]	6.46 [1.21]	p<0.001	6.06 [1.27]	p=0.014	5.77 [1.26]

Mediating effect of coping style on associations between mental health difficulties and DSH

The potential mediating roles of *emotion-oriented* and *problem-oriented* coping on the associations between depression, anxiety and self-esteem and self-harm were investigated. To assess whether the associations between psychological variables and DSH were attenuated when the potential mediators were statistically controlled, we used separate regression analyses to generate odds ratios and 95% confidence intervals for lifetime history of DSH (Table 5). Adjusting for *emotion-oriented coping* resulted in large changes in odds ratios for DSH associated with one unit increase in scores on depression, anxiety and self-esteem scales among both boys and girls. Adjusting for *problem-oriented coping* resulted in smaller changes on all three scales. As the effect of the independent variable on the dependent variable was reduced upon addition of the mediator, there was informal evidence for partial mediation. To test whether these mediation effects reached statistical significance, mediation analysis was carried out (Preacher and Hayes, 2008). Significant mediation effects in the case of *emotion-oriented coping* were observed among both boys and girls for the associations between all psychological variables and DSH. Significant mediation effects of *problem-oriented coping* were observed among girls for the associations between all psychological variables and DSH, but among boys the mediation effect was non-significant in all three cases.

Table 5. Associations between lifetime history of DSH and scores on psychological scales, including adjusting for *Emotion-oriented* and *Problem-oriented coping*

	OR* (95% CI) for DSH	OR* (95% CI) for DSH Adjusting for Emotion-Oriented Coping	Significance of mediation	OR* (95% CI) for DSH Adjusting for Problem-Oriented Coping	Sig. of mediation
Boys					
Depressive symptoms†	1.27 (1.20-1.35)	1.20 (1.12-1.28)	p<0.001	1.26 (1.19-1.34)	p=0.073
Anxiety†	1.32 (1.24-1.39)	1.24 (1.16-1.39)	P<0.001	1.31 (1.24-1.39)	p=0.169
Self-esteem†	0.79 (0.74-0.83)	0.84 (0.79-0.89)	P<0.001	0.79 (0.74-0.84)	p=0.148
Girls					
Depressive symptoms†	1.27 (1.22-1.32)	1.18 (1.13-1.23)	P<0.001	1.25 (1.20-1.30)	p<0.001
Anxiety†	1.22 (1.18-1.27)	1.13 (1.09-1.18)	P<0.001	1.21 (1.17-1.26)	P<0.001
Self-esteem†	0.81 (0.78-0.84)	0.87 (0.84-0.91)	p<0.001	0.82 (0.79-0.86)	P<0.001

* Odds ratio for lifetime history of DSH associated with one unit increase in score on psychological scales.

†p<0.001 in all cases for association between scores on psychological scales and DSH

Mediating effect of coping style on associations between mental health difficulties and self-harm thoughts among adolescents with no history of DSH

Mediation analyses were replicated to investigate possible mediating effects of coping style on risk of self-harm thoughts among those adolescents with no history of self-harm (Table 6). Adjusting for *emotion-oriented coping* resulted in large changes in odds ratios for self-harm thoughts on all scales among both boys and girls, and mediation effects were significant in all cases. Adjusting *for problem-oriented coping* resulted in smaller changes on all three scales and weaker but nonetheless significant mediation effects of *problem-oriented coping* were observed among girls for the associations between all psychological variables and self-harm thoughts. Among boys only the mediating effect of *problem-oriented coping* on associations between depression and self-harm thoughts was significant at the 0.05 level.

Table 6. Subgroup with no history of DSH (n=1632 boys, 1510 girls): Associations between self-harm thoughts and scores on psychological scales, including adjusting for *Emotion-oriented* and *Problem-oriented coping*

	OR* (95% CI) for DSH	OR* (95% CI) For DSH Adjusting for Emotion-Oriented Coping	Significance of mediation	OR* (95% CI) for DSH Adjusting for Problem-Oriented Coping	Significance of mediation
Boys					
Depressive symptoms†	1.24 (1.18-1.31)	1.19 (1.12-1.25)	p<0.001	1.23 (1.17-1.30)	p=0.017
Anxiety†	1.27 (1.21-1.32)	1.20 (1.14-1.26)	p<0.001	1.26 (1.21-1.32)	p=0.184
Self-esteem†	0.80 (0.76-0.84)	0.84 (0.80-0.88)	P<0.001	0.80 (0.76-0.84)	p=0.032
Girls					
Depressive symptoms†	1.31 (1.25-1.38)	1.22 (1.16-1.28)	p<0.001	1.30 (1.24-1.36)	p=0.001
Anxiety†	1.27 (1.22-1.32)	1.19 (1.14-1.24)	p<0.001	1.27 (1.22-1.31)	p=0.001
Self-esteem†	0.78 (0.75-0.81)	0.83 (0.80-0.86)	p<0.001	0.78 (0.76-0.81)	p=0.031

* Odds ratio for self-harm thoughts in past year associated with one unit increase in score on psychological scales.

†p<0.001 in all cases for association between scores on psychological scales and self-harm thoughts

DISCUSSION

In this study we have investigated associations between coping style, mental health factors and self-harm among Irish adolescents. *Emotion-oriented coping*, which includes self-blame, anger, withdrawal and use of alcohol, was strongly associated with poorer mental health. Use of *problem-oriented coping* (attempting to solve problems, seeking social support and reflecting on previous experience) was associated with better mental health, but associations between *problem-oriented coping* and levels of anxiety were not significant among boys. Investigating associations between coping style and self-harm thoughts and acts, we found that higher scores on *emotion-oriented coping* and lower scores on *problem-oriented coping* were associated with greater severity of self-harm history. However, boys with self-harm thoughts did not differ significantly from those with a history of self-harm in terms of coping. We found evidence for a

mediating effect of *emotion-oriented coping* on associations between mental health factors (depressive symptoms, anxiety and self-esteem) and DSH among both genders and between *problem-oriented coping* and all three mental health factors among girls. Similar mediating effects of coping style were found when risk of self-harm thoughts was examined for those young people with no history of self-harm.

We found that girls reported using both types of coping more frequently than boys. This is at odds with some previous research which has found that boys report using negative coping strategies more often than girls (Sawyer et al., 2009). However, the fact that girls report more use of *emotion-oriented coping* reflects the view that girls in particular may use coping strategies which add to malaise and poor mental health (Compas et al., 2001).

The use of *emotion-oriented coping* was associated with poorer mental health on the three scales examined (depressive symptoms, anxiety and self-esteem), while *problem-oriented coping* was associated with scores reflecting more positive mental health. Our findings are in line with previous research which has established a link between coping style and depressive symptoms (Rohde *et al.*, 1990) and self-esteem (Lewinsohn *et al.*, 1994).

Our findings on the associations between coping style and self-harm extend previous research which has shown that adolescents with a history of self-harm report more maladaptive behaviours as ways of coping than their peers (Kirchner *et al.*, 2011, Mikolajczak *et al.*, 2009, Wilson *et al.*, 1995). The comparison of three subgroups of adolescents showed that the greatest difference in terms of coping style is between those with no self-harm thoughts or acts and those with self-harm thoughts but no acts. This highlights the significance of self-harm thoughts as a discrete step in the self-harm process among adolescents, and mirrors earlier findings of the international CASE study (Madge et al., 2011).

We have investigated whether coping methods act as mediators between psychological difficulties and DSH and self-harm thoughts. We found evidence to support the hypothesis that *emotion-oriented coping* accounts to a significant degree for the associations between psychological difficulties (depression, anxiety and low self-esteem) and self-harm among both girls and boys. These findings point to the significance of *emotion-oriented coping* as a maladaptive strategy which contributes to the self-harm process with mental health difficulties as strong associated factors. Our striking findings in terms of the mediating role of *emotion-oriented coping* indicate that self-harm may be understood in many cases as an attempt to manage the negative feelings which are heightened by the use of ineffective emotional coping strategies, as others have previously suggested (Mikolajczak et al., 2009). The mediating effects of *problem-oriented coping* were much smaller than those of *emotion-oriented coping*, and reached statistical significance for girls but not for boys.

Given that adolescents who report self-harm thoughts share a similar profile to those reporting acts of self-harm, we sought to examine the mediating effects of coping style on associations between psychological factors and self-harm thoughts among young people with no history of self-harm. The findings were very similar to those for DSH, with *emotion-oriented coping* playing a significant mediating role in this association, and *problem-oriented coping* playing a smaller role, significant only among girls. Awareness of the importance of coping in mediating associations between mental health problems and self-harm thoughts is important due to the significance of self-harm thoughts as part of the self-harm process.

A limitation of our study was that it examined lifetime history of self-harm, while coping style was assessed at one time point. Previous research has pointed towards changes in coping style as part of adolescent development, and has suggested a possible association between improved decision making and cessation of DSH (Oldershaw et al., 2009). It is possible that changes to coping style over time have made associations with lifetime history of self-harm less valid.

However, as 82% of those who had harmed themselves had done so within the past year (Morey et al., 2008), the associations we have reported may be valid.

As the methodology used was cross-sectional, it is impossible to draw conclusions regarding causal relationships between coping style and associated factors. Causality may be in either direction. Although it is possible that maladaptive coping results from mental health difficulties and contributes to the development of self-harm, previous research has also found problem-solving deficits to be a concomitant, rather than a cause, of depression, hopelessness, and suicide intent (Schotte *et al.*, 1990). The instrument used to assess coping style was brief, and it could be argued that it may not capture the multi-dimensional nature of coping (Compas et al., 2001). The use of a process measure of coping on its own precludes drawing any conclusions about the effectiveness of coping efforts. Also, the labelling of the two coping factors as emotion-oriented and problem-oriented, and the associated assumptions of adaptive and maladaptive approaches, may be considered somewhat arbitrary in the case of some of the items included.

Future research could further address the question of whether the nature and structure of coping as well as associations with mental health change with developmental stage and age, and in response to life stresses. It has been reported that young people with suicidal behaviour report recent histories of more severe life stress, inaccurate appraisal of the extent to which stressful events can be controlled and poorer coping than their non-suicidal peers (Wilson et al. 1995). To further develop an understanding of how coping, mental health problems and self-harm develop, the life situations and stressors with which adolescents cope should be examined as well as their reported coping reactions.

Despite these limitations, this study has employed a rigorous methodology to examine coping style among adolescents. We have built on previous knowledge regarding associations between coping style and self-harm (Evans et al., 2005), specifically through the identification of two

valid coping subscales within the CASE coping measure and through the in-depth examination of associations between coping style, psychological factors and DSH. Our findings on the mediating effect of coping on risk of self-harm thoughts and acts are novel and highlight the important role which adaptive and maladaptive styles of coping play in the self-harm process, with the particular significance of self-harm thoughts as a discrete step in this process.

Our findings suggest that the promotion of positive coping skills and the reduction of emotion-focused approaches may build resilience to self-harm thoughts and acts among those young people who experience mental health problems. The importance of gender-specific approaches to the promotion of effective coping is clear, with a particular focus on the development of problem-oriented coping skills in building resilience among girls. As maladaptive coping is associated with poor mental health and DSH, programmes which aim to teach positive coping skills to adolescents and which reduce use of emotion-oriented coping, for example, by teaching emotion regulation skills, reducing avoidance and reducing use of alcohol or other substances may be effective in tackling the problem of self-harm thoughts and DSH among this group.

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