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The development of first episode direct self-injurious behaviour and association with difficulties in emotional regulation in adolescence

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ABSTRACT

Objective: Self-harm remains a serious public health concern, however, identifying adolescents at risk is challenging. Whilst self-harm has been linked with difficulties in emotional regulation post-injury, comparatively little is known about how such difficulties may impact on the future development of self-harm behaviour.

Methods: 318 pupils aged 14-15 years completed measures on history of direct-self-injurious behaviour (D-SIB), emotional regulation and depression and anxiety at two time points across a six-month period.

Results: 13% (42) of participants reported their first episode of D-SIB over the six-month period and reported increased difficulties with emotional regulation prior to initial D-SIB. Regression analyses found significant associations for emotional regulation, and specifically lack of emotional clarity prior to first episode of D-SIB. Lack of emotional awareness and difficulties with impulse control were significantly associated in those with ongoing D-SIB.

Conclusions: Prior to first episode of D-SIB young people may experience difficulty regulating emotions, a difficulty which appears less pronounced following their engagement with D-SIB. Our findings implicate difficulties in the early evaluation and understanding of emotions which may later impair attempts at emotion modulation and increase risk of D-SIB. Such findings might help inform early identification of adolescents at risk of initial D-SIB.

INTRODUCTION

Adolescent and childhood self-harm is a serious public health concern (Brunner et al 2014; Hawton et al 2012) and is typically, though problematically, defined as deliberate self-injury or self-poisoning regardless of motive or intent regarding suicide (Hawton et al 2012). Definitions such as 'non-suicidal self-injury' (NSSI) have typically been used to denote any method of self-harm without suicidal intent whilst the term 'deliberate self-harm' (DSH) allows for the inclusions of intent and methods, such as self-poisoning, which are more associated with suicide attempts (Kapur et al 2014). Recently the term deliberate self-injurious behaviour (D-SIB) has

been used which views self-harm as on a continuum with suicide but only assesses direct injury to the surface of the skin (Brunner et al 2014). Pan-European studies have found self-harm to be common in adolescents (Madge et al 2008) with overall lifetime prevalence reported to be as high as 28% in 14-15 year olds (Brunner et al 2014). Whilst recent evidence suggests an increase in hospital admissions for self-harm in England (Hawton et al 2016), hospital admissions may underestimate prevalence (Clements et al 2016). Overall estimated prevalence rates in the community vary, with figures ranging between 7%-47% (Hawton et al 2002; Kidger et al 2012; Lloyd-Richardson et al 2007). Self-harm prior to age 12 has been identified (Barrocas et al 2012) although uncommon, and rates gradually increase during adolescence; most commonly in young girls, (Hawton et al 2002; Ross & Heath 2002; Hilt & Christine et al 2008) although gender differences diminish as age increases (Carr et al 2016). Evidence suggests that increases in self-harm during adolescence may be related to a young person's ability to regulate their emotions, (Bentley et al 2015; Klonsky 2009) although little is known regarding how emotional regulation may be implicated in the initial development of self-harm and how self-harm enactment might be prevented.

Explanatory models of self-harm suggest a functional role for self-harm, with such behaviour acting as an external maladaptive method of modulating aversive emotions (Chapman et al 2006; Nock 2010; Bentley et al 2015). As with other internal maladaptive strategies, self-harm fails to provide lasting affect modulation (Nock et al 2006; Schafer et al 2017) which may underpin the need to employ multiple methods of self-harm, associated with increased risk of later life suicide (Nock et al 2006; Zlotnick et al 1996). Conversely, the acquisition of *adaptive* emotional regulation strategies is associated with self-harm cessation (Whitlock et al 2015). Recent meta-analyses support coping based theories of self-harm and suggest it to be trans-diagnostic across a range of emotional disorders (Bentley et al 2015) with increased risk for adolescent self-harm in those with anxiety, depression (Fliege et al 2008; Laye-Gindhu & Schonert-Reichl 2004), impulsivity (Lockwood et al 2017; O'Connor et al 2009) and aggression (Madge et al 2008; Skegg 2005). Adolescence has been characterized as a period of impaired cognitive functioning in emotionally charged environments (Casey & Caudle 2013) and decreased emotional coping (Zimmerman & Iwanski 2014) within which young people use a range of coping strategies to modify emotional affect (Riediger & Klipker 2014). Whilst this transitionary period to adulthood provides increased opportunities for learning positive methods of emotion modification, it may, nevertheless, expose young people to the use of maladaptive coping strategies including the development of self-harm and impaired mental well-being (Paus et al 2008; Thompson & Calkin 1996).

Although strong evidence exists for the association of self-harm with regulation of emotions (Bentley et al 2015; Klonsky 2009; Perez et al 2012; Mikolajczak et al 2008), there has been a lack of explicit assessment of emotional regulation in the development of self-harm and a tendency to view emotional regulation in discrete terms (Cole 2014; McKenzie & Gross 2014). Emotion-generative theories suggest a linear process of emotion (Gross 2001) in which emotional cues are subject to monitoring and evaluation early in the processing of emotions and have implications for later attempts at emotional modulation (Thompson & Calkin 1996). Accounting for the multifaceted nature of emotional regulation, Gratz & Roemer (2004) proposed a multidimensional conceptualization compromised of 6 distinct (although related) dimensions; awareness, understanding, acceptance, control, modulation and an ability to act as desired regardless of emotional state. Few studies have individually assessed these dimensional concepts of emotional regulation alongside self-harm. Those that have, suggest self-harm to be specifically associated with an inability to comprehend emotions (Gratz & Roemer 2008) and limited access to emotional regulation strategies (Perez et al 2012; Gratz & Roemer 2008; Emery et al 2016).

There is, however, little research on how the specific dimensions of emotional regulation may prospectively predict self-harm in adolescents in the community. To date, the majority of research on self-harm has been conducted *post* self–injury, and is therefore limited in assessing factors relating to the initial development of self-harming behaviour. The results are mixed (O'Connor 2009; Hankin & Abela 2011; Andrew et al 2014; Stallard et al 2013 & Garisch & Wilson 2015) highlighting that antecedents are likely multifactorial and operating at proximal and distal time points from initial self-harming behaviour (Hankin & Abela 2011). Psychological vulnerabilities and aspects relating to psychological coping have been cited as predictors by several investigators (Nicolai et al 2016, Hankin & Abela 2011, Andrew et al 2014, Garisch & Wilson 2015) and self-harm may be directly related to psychological vulnerabilities which in turn elicit negative environmental influences such as bullying, which indirectly contribute to self-harming behaviour (Garisch & Wilson 2015).

Although emotional regulation has been found to be associated with both self-harm and a range of psychological disorders (Gratz 2003; Bentley et al 2015; Klonsky 2009; Perez et al 2012; Mikolajczak et al 2008) few studies have directly assessed emotional regulation in prospective self-harm. Andrews et al (2014) assessed two emotional regulation strategies; emotional suppression and cognitive reappraisal in a logistic regression of predictors for adolescent self-harm in the community. Several significant predictors including psychological distress and problem solving predicted engagement of self-harm, whilst the two emotional regulatory strategies

were not prospectively related to self-harm. Considering there is convincing theoretical (Chapman et al 2006; Nock 2010; Bentley et al 2015) and empirical evidence (Bentley et al 2015; Klonsky 2009; Perez et al 2012; Mikolajczak et al 2008) for the association of emotional regulation and self-harm *post-injury*, further investigation is needed to understand the role of emotional regulation in first episode self-harm.

OBJECTIVE

The objectives of this study are:

i) to examine the prevalence of D-SIB in a community population of male and female adolescents aged 14-15years old;

ii) to identify young people, aged 14-15 years, in the community, who develop D-SIB during a 6-month period;

iii) to explore the relationship between emotional regulation, anxiety and depression and the development of D-SIB in adolescents aged 14-15 years

METHOD

Design

Data analysed in this paper was taken from our wider two-year longitudinal study (N = 783) into early emergence of eating disorders in school-age children. This study captured reported D-SIB in 626 young people aged 14-15 years at two time points, six-months apart; T1 Sept 2015 (n = 493) and T2 March 2016 (n = 489). 270 participants completed only 1 survey and, whilst included in the overall analysis of prevalence, were removed from the analysis regarding transition to D-SIB. Participants who only submitted 1 survey did not differ in gender (Male 57%), ethnicity (White 59%, Black 7%, Asian 20%, Mixed/Other 13%) and living status (Both Parents 61%). 356 participants completed all measures at both T1 and T2 and formed the main focus of our transition analysis. Direct self-injurious behaviour was defined as scoring either 'occasional' or 'repetitive' on the deliberate self-injurious behaviour scale. 38 participants reported D-SIB at T1 but not at T2. As we could not guarantee that this 'reverse transition' group had previously self-harmed but subsequently improved, or whether this was a consequence of misreporting, they were not included in the ongoing self-harm group but marked for separate analysis.

Recruitment

Schools were approached and recruited via the 'SchoolSpace Network'; a network of schools working with CLAHRC WM (Collaborations in Leadership in Applied Health Research and Care West Midlands) with regard to youth mental health and receiving mental health education. Any school in the Birmingham area could join the network and attempts were made to recruit schools across the city to represent demographic and school variation in Birmingham. Population estimates for Birmingham are 1,101,360 as of 2014 (Office for National Statistics, UK 2016). Birmingham is a young city (22.9% 0-15 years old, 47% under 30 years old (50.6% male) and is highly diverse, with significantly fewer White British inhabitants (570,217, 53.1%) than the national average (79.8%). Other large ethic groups present in the city are Pakistani (144,627, 13.5%), Indian (64,621, 6%) and Black Caribbean (47,641, 4.4%) (Office of National Statistics, UK 2016). Our sample was broadly representative of the wider population of Birmingham although we found males (58%) and those of White British ethnicity (62%) slightly over represented. All participants were between 14-15 years old. Birmingham Local Education Authority has 98 state funded secondary schools, in which 54% of pupils received 5 GCSEs A* to C, 2%; this is lower than that national average (Department of Education, UK 2015). The city has 43 independent schools (Schoolsnet 2016).

Nine schools were initially approached and three schools declined (community all-girls school n = 132; foundation mixed school n = 104; academy mixed school n = 179) and one other school (independent all-girls school n = 71) opted out of the study prior to T1 Sept 2015, leaving a total of five schools (independent all-boys school n = 123; academy mixed school n = 166; community all-boys school n = 89; community mixed school n = 211; foundation all-girls school n = 89). Consent to participate in the study was obtained from each school and student and/or parent participation presumed unless they chose to opt out via a non-participation form, at which point they were removed from the study. Ethics for consent were approved by the University of Birmingham Ethics Committee (Ethics No. ERN_14-0738).

The Survey

The survey was implemented via links on the www.youthspace.me website, a resource designed and developed to provide a range of youth mental health resources for communities and schools. Individual members of staff whose role was to support pupil well-being in their school were identified and were responsible for inviting all students in year nine to participate in the survey.

Students in participating schools were sent an email providing information on registration and participation procedure and given a link to the secure portal. Prior to activating each survey session pupils were given a

unique personal access code (PAC) which allowed them securely log into the survey software. Each survey session was supervised by teachers and researchers and took place at agreed time-slots in the school timetable. Each data collection phase had an 'open period' of 4-6 weeks allowing schools to coordinate sessions across school timetables and give pupils opportunity to complete the survey over several sessions as required.   PACs expired on completion of the survey or at the end of 'open period' removing access until the next 'open period'.

Data was collected securely at each phase and held in a protected administrative web portal managed by a digital healthcare partner Vision360©; no personal data was stored in this database.   Access to data was only granted to the small team of researchers verified as administrators via personal logins and passwords.   This enabled researchers to view the survey during the live and completed phases of the survey and monitor participation.

All data was confidential and was not disclosed to anyone outside of the research team. Due to the high overall level of reported self-harm in the study each school was offered education and teacher training sessions focused on recognising and signposting for self-harm. Schools with concerns about their pupils were supported in seeking advice and help from a local mental health provider (Birmingham Children's Hospital).

Measures

Difficulties in emotion regulation scale – DERS (Gratz & Roemer 2004)

A 36-item self-report measure assessing difficulties in emotional regulation rated on a 5-point scale, global score range 36-180. Higher scores indicate a greater degree of difficulty with emotional regulation. Descriptive cut-off points for global score are defined as; 5-45 Not Difficult, 46-85 Slight Difficulty, Moderately Difficult 86-125, Difficult 126-165, Very Difficult 166-180. Global score comprises of 6 sub-scales: *Lack of emotional awareness* or lack of an individual's ability to attenuate and acknowledge emotions; *Lack of emotional clarity* or lack of an individual's ability to understand and make sense of their emotions; *Impulse control difficulties* or lack of an individual's ability to control their behaviour; *Difficulties engaging in goal-directed behaviour* or lack of an individual's ability to focus or concentrate on tasks whilst experiencing negative emotions; *Non-acceptance of emotional responses* or lack of an individual's ability to accept and not feel ashamed of emotions; and *Limited access to emotional strategies* or an individual's lack of belief in their ability to positively modulate

negative emotions.   Difficulties with any or all of these dimensions are representative of the presence of emotional dysregulation.   The DERS has been found to have good construct validity in mental health populations (Fowler et al 2014) and adolescents (Wernberg & Klonsky 2009).   Both overall DERS and subscales have been found to display good internal consistency ($\alpha = 0.93$) within clinical (Gratz et al 2008) and non-clinical populations (Gratz 2004), construct and predictive reliablity, and test-retest reliability across four to eight weeks ($p = <.01$) [Gratz 2004].

Direct Self-Injurious Behaviour Scale – D-SIB (Brunner et al 2014)

A six-item questionnaire assessing frequency of direct self-injurious behaviours (D-SIB) regardless of suicidal intent i.e. intentional self-inflicted damage to the surface of the body by; cutting, burning, hitting, biting, skin damage via wound healing prevention and hospitalization - each item response ranged from 1 (Never) to 4 (Many times). This six-item measure is based on the nine-item DSHI questionnaire from Bjarehed and Lundh (Bjarhed & Lundh 2008); and was edited slightly in line with UK guidance on presenting self-harm to adolescents (PSHE Association, UK 2015). Occasional D-SIB was defined as 1-4 reported lifetime acts of D-SIB and repetitive D-SIB was reported as ≥ 5 events of D-SIB during lifetime. Cut-off points were according to diagnostic criteria of NSSI (DSM-5). The DSHI has been found to have high internal consistency ($\alpha = 0.82$); adequate construct, convergent and discriminant validity and adequate test-retest reliability ($\varphi = 0.68$) in both community and clinical populations (Fliege et al 2006; Gratz 2001). A short-form version has been found to have good test-retest stability in early adolescents at eight weeks (p= <.001) (Bjarhed & Lundh 2008).

Hospital Anxiety and Depression Scale – HADS (Zigmond & Snaith 1983)

A 14-item self-assessment scale detecting depression (HADS-D; 7-items) and anxiety (HADS-A; 7-items) in clinical and general populations. Each item on the measure uses a four-point likert scale with a total range of 0-21 for depression/anxiety. Greater scores indicate greater levels of depression/anxiety. Descriptive cut-off points for combined scores (depression & anxiety) are defined as: 0-14 Normal, 15-20 Borderline, 21-40 Abnormal. The measure has good reliability; internal consistency HADS-A ($\alpha = 68-.93$) and HADS-D ($\alpha = 67-.90$), and has medium to strong concurrent validity with similar measures such as the Beck Depression Index HADS-A (0.61-0.83) and HADS-D (0.62-0.73) (Bjelland et al 2002). Both HADS-A and HADS-D have been judged as excellent case finders (AUC = 0.84-0.96) for anxiety and depression in patients seeking support from a general practitioner (Bjelland et al 2002).

Statistical Analysis

Overall reported self-harm was taken from our study at T2 using raw continuous data so that counts and percentages could be tabulated. Odd ratios were calculated for gender differences. Pearson correlation coefficients were used to investigate relationships between covariates. Our longitudinal study grouped participants in terms of i) those who transitioned to D-SIB; ii) those who reported ongoing D-SIB; and iii) those who reported no D-SIB and were analyzed with their corresponding Global DERS Score and Global HADS Score for significance testing. One-way analysis of variance (ANOVA) was used to assess differences in response between groups; diagnostic (quantile-quantile) plots showed assumptions of normality were reasonable. Statistical significance was assessed at 5% level and adjustments were made for multiplicity using Tukey's HSD. To further assess associations of DERS Global Score and binary response variable a logistic regression analyses was performed controlling for HADS Global Score in the first step. Logistic regression modelling was conducted on transistioners and no-D-SIB group assessing dimensions of DERS between explanatory variable data at T1 and D-SIB at T2 after controlling for HADS Global Score. Prior to regression modeling the existence of multicollinearity of components were assessed by calculating formal detection-tolerance and variance inflation factors (VIF). Tolerance between predictors were >0.1 (Menard 1995) and a variance inflation factor <10 (Myers 1990) therefore proceeding with the analysis was deemed acceptable All analyses were undertaken using SPSS version 24; all tests were two-sided and at the 5% level.

RESULTS

Reported Direct-Self-Injurious Behaviour: 626 participants completed at least one survey of whom 251 participants (40% point prevalence) reported D-SIB at least once during the 6 month period, with females more likely to report D-SIB than males (OR 1.44, p = < .05).

270 (43%) of the young people in our study completed only one survey. Of those, 97 (36%) of young people reported D-SIB (DERS Global Score M = 103.7 SD = 27.78, HADS Global Score M = 18.09 SD = 5.77) and 173 (64%) reported no D-SIB (DERS Global Score M = 78.57 SD = 26.64, HADS Global Score M = 11.75 SD = 5.88). These young people did not differ from those completing two surveys in terms of their gender, ethnicity, and living status.

The aim of this study was to investigate how difficulties in emotional regulation may be associated with the development of first episode D-SIB. Therefore, only participants who had completed measures at both time points enabling assessment across the six-month study period were included in the analysis. The final sample (n

= 318) included 42 (13%) participants with their first act of D-SIB between T1 and T2 ('Transitioner'), 74 (23%) participants reporting D-SIB at both time points ('on-going D-SIB'), 202 (64%) participants with no D-SIB ('No D-SIB'). In the final sample 187 (59%) were males and 192 (60%) lived with both parents as opposed to living in a single parent family. Ethnic breakdown of the final sample was predominately White 204 (64%) with Asian 55 (17%), Black 16 (5%) and Mixed/other 43 (14%) Table i shows that demographics were broadly the same across all D-SIB and no D-SIB groups, except more females 43 (58%) reported on-going D-SIB compared to those transitioning 16 (38%) and those reporting no D-SIB 72 (36%). More participants also reported living with only one parent in both transitioner 23 (55%) and ongoing D-SIB 40 (54%) groups compared to those who reported no D-SIB at either time point 63 (31%).

<Add table i here>

Difficulties in Emotional Regulation (DERS)

Table ii shows that the 'Ongoing D-SIB' group reported the highest levels of difficulties in emotional regulation at both T1 and T2 whilst participants who reported no D-SIB at either time point reported the lowest levels of emotional difficulties. A one-way ANOVA found statistically significant differences between the three groups and DERS Global Score at T1 F (2, 94.403) = 54.643, p = <.001 and T2 F (2, 97.176) = 49.692, p = <.001. Post-hoc comparisons using Tukey HSD indicated that mean scores for all groups were significantly different from each other at both time points.

Depression and Anxiety (HADS)

Table ii shows that the 'Ongoing D-SIB' group reported the highest levels of anxiety and depression at T1 and T2 whilst participants with no D-SIB at either time point reported the lowest levels of anxiety and depression (Table ii). A one-way ANOVA found statistically significant differences between the 3 groups and HADS Global Score at T1 F (2, 1825.44) = 45.806, p = <.001 and T2 F (2, 2012.47) = 60.09, p = <.001. Post-hoc comparisions using Tukey HSD indicated that mean scores for all groups were significantly different from each other at both time points.

<Add table ii here>

Transitioners v No D-SIB group

To assess the association between DERS in the development of D-SIB behaviour a binary logistic regression was conducted on DERS Global Score for the transition group and no D-SIB group at T1. As DERS has previously been associated with psychopathologies such as depression and anxiety (Ahmed et al 2015 & McLaughlin 201) HADS Global Score was used as a control variable in the regression analysis. Only DERS Global Score remained significant in the final model at T1. Further analyses of the dimensions of DERS at T1 revealed only lack of *emotional clarity* exp(B) 1.19 CI 95% [1.068-1.345] was significantly associated with first episode D-SIB whilst controlling for HADS Global Score. Analysis of transition group Global Scores at T2 revealed that only HADS Global Score remained significant in the final model.

Ongoing D-SIB group v No D-SIB group

To further assess DERS role in the development of D-SIB a binary logistic regression was conducted on DERS Global Scores at T1 for the ongoing D-SIB and no D-SIB group; again HADS Global Score was used as control. Only DERS Global Score remained significant in the final model at T1. Dimensional analyses of T1 scores of those in the ongoing D-SIB group found only *lack of emotional awareness* exp(B) 1.072 CI 95% [1.009-1.139] and *impulse control difficulties* exp(B) 1.117 CI 95% [1.031-1.209] were significantly associated with D-SIB when controlling for HADS Global Score. Analysis of ongoing D-SIB group global scores at T2 found both DERS Global Score and HADS Global Score significant in the final model. Assessing ongoing self-harm dimensions again at T2 found *lack of emotional awareness* exp(B) 1.105 CI 95% [1.037-1.177] and HADS Global Score exp(B) 1.123 CI 95% [1.038-1.216] were significantly associated with D-SIB. *Difficulties in impulsivity* was also found on the fringe of significance at p = < 0.1 level exp(B) 1.075 CI 95% [.986-1.173].

Reverse Transitioners

The main aim of this study was to examine the association between difficulties with emotional regulation and the development of D-SIB across a six-month period. However, we also found a small group of young people ('reverse transitioners') who reported D-SIB at T1 but not at T2. As we were unable to guarantee the validity of this reporting (in terms of their improvement or mis-reporting) we did not include this group in our main analysis. However, their presence in our sample prompted brief analysis of this interesting group. Compared to our other groups, these young people were predominantly of Asian heritage (31%) and living with both parents (71%). Logistic regression of Global Scores found only HADS Global Score significant at T1 and T2 in this group.

Gender differences within D-SIB groups

To assess gender differences between D-SIB groups secondary analyses were performed for the effect of gender on Global DERS and Global HADS at each time point for each self-harm group. ANOVA analysis found no significant differences between males and females in both the transitioner or ongoing D-SIB groups. Significant differences were found for Global DERS scores between male (T1 = 69.32, T2 = 71.05 p=<.001) and female (T1 = 85.83, T2 = 83.88 p=<.001) and Global HADS scores between males (T1 = 10.24, T2 10.84 p=<.001) and females (T1 = 13.51, T2 = 14.01 p=<.001) at each time point in the no D-SIB group.

DISCUSSION

Relatively high levels of reported D-SIB (40% point prevalence) were found in this community sample of young people aged 14-15 years. Overall levels of reported D-SIB were comparable to levels reported in France (38.5%) Germany (35.1%), Estonia (32.9%) and Israel (32.6%) in the most recent large scale community study on D-SIB (Brunner et al 2014) (SEYLE study), which used the same assessment criteria and age range. Similarly, we found females were more likely to report D-SIB, which echoes previous literature suggesting greater prevalence rates for female self-harm (Clements et al 2016; Ross & Heath 2002; O'Connor et al 2009). No significant differences were found for emotional regulation or anxiety and depression between females and males in both D-SIB groups. Females who reported no D-SIB were found to have both significantly higher levels of difficulties in emotional regulation and anxiety and depression than males who reported no D-SIB at either time point. This may support previous evidence that females have poorer overall levels of mental health than males in the general population (Hilt & Christine 2008) which may increase risk of D-SIB.

The primary aim of this study was to investigate the role of difficulties with emotional regulation in predicting first episode D-SIB. This required young people to have completed two surveys across a six-month period. We identified three distinct groups of young people; those with no D-SIB, those who reported D-SIB at both time points during the study (ongoing D-SIB) and those who recently transitioned to D-SIB (transitioners). Difficulties with emotional regulation and depression/anxiety were both independently associated with these groups.

Transitioners and those who reported ongoing D-SIB

Difficulty with emotional regulation was associated prospectively with D-SIB for those who had recently transitioned to D-SIB, although emotional regulation was not associated in this group after D-SIB had taken place at T2. For those reporting ongoing D-SIB emotional regulation was associated with D-SIB at both time points. This suggests that transitioners may have experienced a more pronounced difficulty with emotional regulation prior to engaging in D-SIB, a difficulty which appears less pronounced following this initial engagement with D-SIB behaviour. Our findings support previous functional concepts of self-harm (Nock 2010) which suggest self-harm may operate as a primitive form of emotional coping across a variety of psychopathologies (Bentley et al 2015; Mclaughlin & Mennin 2011) which ultimately fails to provide lasting affect modulation (Nock et al 2006; Schafer et al 2017).

Whilst research has examined emotional regulation in first episode self-harm few have focused directly on the specific dimensions of emotional regulation. Our findings of a significant association with first episode D-SIB may, in part, be due to our use of the multidimensional difficulties in emotional regulation scale (Gratz & Roemer 2004). Despite theoretical (Chapman et al 2006; Nock 2010; Bentley et al 2015) and empirical evidence (Bentley et al 2015; Klonsky 2009; Perez et al 2012; Mikolajczak et al 2008) for the association of emotional regulation and self-harm *post-injury*, previous research had found two specific dimensions of emotional regulation; emotional suppression and cognitive reappraisal to be unassociated with prospective self-harm (Andrews et al 2014). This could suggest that broader concepts of emotional regulation are associated with prospective self-harm.

To further examine the role of emotional regulation in first episode D-SIB we carried out regression analyses on the dimensions of the difficulties in the emotional regulation scale (Gratz & Roemer 2008). Previous research from inpatient and older adolescent post-injury populations suggests that prospective self-harm is most associated with the *limited access to strategies* component of DERS (Perez et al 2012; Emery et al 2016; Gratz & Roemer 2008). We did not find such an association with first episode D-SIB, in fact our findings revealed that prior to D-SIB, *lack of emotional clarity* was the only emotional difficulty significantly associated with the development of initial D-SIB whilst controlling for anxiety and depression. In those with ongoing D-SIB only *lack of awareness* and *impulse control difficulties* were significantly associated with their D-SIB behaviour. Our findings tentatively suggest that lack of emotional clarity may be an antecedent to first episode of D-SIB

and that capacity for coping with emotional regulation may change after engaging with D-SIB. Emotional clarity is a distinct component of emotional awareness which represents how competently an individual can clearly identify and categorise his or her emotional experience (Gratz & Roemer 2004; Gohm & Clore 2002) which has previously been associated with self-harm (Gratz & Roemer 2008). Being able to detect and discriminate emotions is considered crucial in the first stage of identification of emotions (Gross 2015) and is associated with improvements in emotional regulation, adaptive coping styles and better mental health and well-being (Gohm & Clore 2002). It could be that these initial difficulties in the early evaluation of emotion set a course of impaired emotional coping that increases risk of D-SIB. These findings suggest that helping adolescents to first identify and comprehend emotions are important elements in the initial prevention of D-SIB.

The emergence of the dimension '*lack of awareness*' in our findings is intriguing and may suggest that ongoing D-SIB may impact on a young person's capacity to attend to their emotions. This may suggest that over time the affect modulating properties of D-SIB may allow individuals to remain dislocated from emotions which are too painful to consciously attend to, and indeed therapeutic interventions have incorporated the rebuilding of emotional awareness as a means of treating self-harm enactors (Gratz et al 2007).

It was surprising that we did not find impulsivity associated with prior to engagement with D-SIB. Evidence has suggested difficulties with impulsivity are associated with self-harm behaviour in community school-aged adolescent samples (Hawton et al 2002; O'Connor et al 2009) and specifically, the initiation of self-harm, which may act as a bridge between intention and enactment (Lockwood et al 2017). Our findings may suggest that impulsivity is more pronounced at the moment of enactment. This would support existing evidence which suggests that self-harm repeaters are more impulsive than those self-harming for the first time and in turn, are more impulsive than those who have never self-harmed (Evans et al 1996). Though generally supportive of such theories, our findings are suggestive of a pathway to D-SIB, one which may begin with impaired abilities to identify and label emotions, followed by engagement in D-SIB with associated reduction in awareness of feelings and increased feelings of loss of control.

In addition to our main findings, we also found a small group of young people who we termed 'reverse transitioners' which warranted a brief analysis. They had similar overall levels of emotional regulation and depression as transitioners, which may suggest they were experiencing a similar level of psychological distress. Inconsistent reporting of self-harm in longitudinal studies is common, and though poorly understood, has been

suggested to occur in as many as a third of participants reporting self-harm (Mars et al 2016). The reverse transitioners in our sample mainly identified as Asian and lived with both parents. Evidence suggests that individuals from ethnic minority backgrounds, who engage in self-harm behaviour, are less likely to re-present to services (Cooper et al 2010), which may suggest a lower-level and therefore potentially transient relationship with self-harm, or, indeed, a reluctance to report self-harm behaviour. Inconsistency in reporting could however be for a variety of reasons such as; denial, reinterpretation, problems with recall, mood and misinterpretation of the measures (Velting et al 1998) which limits our interpretation of this group.

Limitations

Whilst the use of self-reported measures is thought to decrease reliability, we believe that using online resources improved access and increased participation of young people, especially with regards to confidentiality. Measures were standardized with good reliability, however self-harm was assessed via only six-items and anxiety and depression were assessed via symptomology alone. This potential loss of sensitivity was considered alongside the accessibility of considering a community population. It should also be considered that dimensional analysis of the difficulties in emotional regulation scale, whilst indicative of potential associations, are limited as comprehensive measures of individual components of emotional regulation. For example, the dimension *impulse control difficulties* refers specifically to a loss of control and therefore only considers one distinct unidimensional component of impulsivity (Lockwood 2017).

Our study suggests 40% of participants had engaged in self-harm at least once in the past Although similar to other community prevalence estimates in other countries and the UK (Brunner et al 2014, Lloyd-Richardson et al 2007), this finding may in part reflect our use of convenience sampling in the study. Considerations should be also taken regarding the using of deliberate self-injurious behaviour to measure of self-harm as it only considers direct intentional damage of the skins surface regardless of intent for suicide. Therefore, it is feasible that some reported self-harm might be classified as a suicide attempt, although the ingestion of hazardous or toxic materials has been found to have greater association with suicide attempts, which are absent in this measure (Kapur et al 2013). As the study was in the community we cannot draw conclusions regarding clinical populations and we cannot assume generalizability due to our modest sample size. In addition, due to one of the all-girls schools in the study opt-ing out there was an overrepresentation of males in our sample. Whilst we view our findings as preliminary, we believe they are of interest. Future studies should aim for a bigger sample

and longer follow-up period. Caution should be exercised regarding assumptions of causality as our study focused on emotional regulation and anxiety and depression, and as such there is the possibility that unmeasured variables influenced results. We do, however, highlight the relative lack of investigation into first episode self-harm in adolescent community populations, with the present study providing useful short-term longitudinal data on the relationship between self-harm and emotional regulation. Obtaining such data is particularly challenging in schools, where issues regarding access and heightened sensitivity surround the discussion of self-harm in young people.

Whilst emotional regulation is broadly associated with self-harm in adolescence (Gratz & Roemer 2008; Klonsky 2009; Perez et al 2012) it is still poorly understood (Zimmeran & Iwanski 2014; Cole 2014) and no studies to date have used the DERS dimensions to explore first episode self-harming behaviour in this age range in the community. Our results suggest that difficulties with emotional clarity may act as a barrier to adaptive emotional regulation in some young people and lead to their engagement in D-SIB. Their impaired ability to cope with their emotions increases their risk of self-harm. Those with ongoing engagement with D-SIB may experience a subsequent decrease in emotional awareness and lack of impulse control. These findings suggest that helping adolescents to first identify and comprehend emotions may be important elements in the initial prevention of self-harm and inform the early identification of young people who may be at risk.

ADDITIONAL STATEMENTS

Conflicts of Interest

On behalf of all authors, the corresponding author states that there is no conflict of related to this submission.

Ethical Standards

The authors assert that all procedures contributing to this work comply with the ethical standards of national and institutional guides on performing research with human research ethics and that this study received ethical approval via the University of Birmingham Ethics Committee (Ethics No. ERN_14-0738).

All persons gave informed consent prior to their inclusion in the study.

Human rights & consent statements

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Table i. *Demographic characteristics for self-harm groups*

	No D-SIB group N (%)	**Ongoing D-SIB** N (%)	**Transitioner** N (%)	**Totals** N (%)
Total N (%)	202 (64)	74 (23)	42 (13)	318 (100)
Gender N (%)	Males 130 (64) Females 72 (36)	Males 31 (42) Females 43 (58)	Males 26 (62) Females 16 (38)	Males 187 (59) Females 131 (41)
Living Status N (%)	Both Parents 139 (69) Single/Family 63 (31)	Both Parents 34 (46) Single/Family 40 (54)	Both Parents 19 (45) Single/Family 23 (55)	Both Parents 192 (60) Single/Family126 (40)
Ethnicity N (%)	White 125 (62) Black 10 (5) Asian 40 (20) Mixed/Other 27 (13)	White 52 (70) Black 4 (5) Asian 8 (11) Mixed/Other 10 (14)	White 27 (64) Black 2 (5) Asian 7 (17) Mixed/Other 6 (14)	White 204 (64) Black 16 (5) Asian 55 (17) Mixed/Other 43 (14)
Frequency Self-harm T1	-	Occasional 39 (53) Repetitive 35 (47)	-	Occasional 39 (12) Repetitive 35 (11)
Frequency Self-harm T2	-	Occasional 39 (53) Repetitive 35 (47)	Occasional 30 (71) Repetitive 12 (29)	Occasional 69 (22) Repetitive 47 (15)

Table ii. *Self-harm group mean scores for DERS Global Score and HADS Global Score at T1 and T2*

		No D-SIB group (*N* = 202)	Ongoing D-SIB group (*N* = 74)	Transitioner group (*N* = 42)
DERS Global Score* *M (SD)*	T1	75.21 (24.66)	114.99 (30.27)	89.69 (22.85)
	T2	75.62 (23.46)	112.7.2 (29.82)	92.10 (22.03)
HADS Global Score* *M (SD)*	T1	11.41 (5.92)	19.58 (7.54)	14.52 (5.70)
	T2	11.97 (5.7)	20.24 (6.49)	17.14 (4.74)

*DERS scale = 5-45 Difficult, 46-85 Slight Difficulty, 86-125 Moderately Difficulty, 126 -165 Difficult, 166-180 Very Difficult *HADS scale = 0-14 Normal, 15-20 Borderline, 21-40 Abnormal