A sequence analysis of patterns in self-harm in young people with and without experience of being looked-after in care

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Abstract

Objectives: Young people in the public care system ('looked-after' young people) have high levels of self-harm. **Design:** This paper reports the first detailed study of factors leading to self-harm over time in looked-after young people in England, using sequence analyses of the Card Sort Task for Self-harm (CaTS). **Methods:** Young people in care (looked-after group: $n = 24$; 14-21 years) and young people who had never been in care (contrast group: $n = 21$; 13-21 years) completed the CaTS, describing sequences of factors leading to their first and most recent episodes of self-harm. Lag sequential analysis determined patterns of significant transitions between factors (thoughts, feelings, behaviours, events) leading to self-harm across six months. **Results:** Young people in care reported feeling better immediately following their first episode of self-harm. However, fearlessness of death, impulsivity and access to means were reported most proximal to recent self-harm. Although difficult negative emotions were salient to self-harm sequences in both groups, young people with no experience of being in care reported a greater range of negative emotions and transitions between them. For the contrast group, feelings of depression and sadness were a significant starting point of the self-harm sequence six months prior to most recent self-harm. **Conclusions:** Sequences of factors leading to self-harm can change and evolve over time, so regular monitoring and assessment of each self-harm episode is needed. Support around easing and dealing with emotional distress is required. Restricting access to means to carry out potentially fatal self-harm attempts, particularly for the young persons with experience of being in care, is recommended.

Key words: self-harm; adolescence; sequence analysis; children in care; looked-after children.

Practitioner Points

- Self-harm (and factors associated with self-harm) can change and evolve over time; assessments need to reflect this.
- Looked-after young people reported feeling better after first self-harm; fearlessness of death, access to means and impulsivity were reported as key in recent self-harm.
- Underlying emotional distress, particularly depression and self-hatred were important in both first and most recent self-harm.
- Looked-after young people should undergo regular monitoring and assessment of each self-harm episode and access to potentially fatal means should be restricted.
- The CaTS would have clinical utility as an assessment tool
- Recruiting participants can be a significant challenge in studies with looked-after children and young people.
- Future research with larger clinical samples would be valuable.

A sequence analysis of patterns in self-harm in young people with and without experience of being looked-after in care

Young people living in public care (living in foster or residential care – referred to as 'looked-after' young people in the UK) are at increased risk of self-harm (Stanley, Riordan, & Alaszewski, 2005), yet there is limited research in this group. Self-harm refers to any self-injury or self-poisoning regardless of suicidal intent (Hawton et al., 2007). This can be a sign of serious emotional distress, and a history of self-harm is strongly associated with the risk of eventual suicide (Hawton et al., 2011; D. Owens, Horrocks, & House, 2002). Cohort studies in Sweden and North America indicate that young people in care should be regarded as a high-risk group for suicide attempts and completed suicide, with risk estimates around two- to four times that of the general population (Hjern, Vinnerljung, & Lindblad, 2004; Katz et al., 2011; Pilowsky & Wu, 2006; Vinnerljung, Hjern, & Lindblad, 2006). It is, therefore, essential to better understand self-harm in care settings and to consider how to best support young people in care who self-harm. This paper describes findings from the first detailed study on self-harm in young people looked-after in care in England. 'Looked-after' children and young people are children in local authority care living away from their families as a result of an interim, emergency protection or full care order (child at significant risk of harm) or the request of their parent(s). Care placements include foster family care, kinship family care and care in a residential home. Young people cease to be looked-after at age 18, though most are entitled to leaving care support until 21 years of age (referred to here as 'care leavers').

In 2013-2014, 68,840 children and young people were looked after by local authorities in England, with the majority (62%) being placed in care due to actual or perceived risk of abuse or neglect (Department for Education, 2014). Young people in care are likely to have individual negative life events and experience of adversity (historic and

current) that are risk factors for self-harm and suicide (Hawton, Saunders, & O'Connor, 2012; Madge et al., 2011). These include physical or sexual abuse in childhood, dysfunctional family background, maladaptive parenting and relational difficulties (Fergusson & Lynskey, 1995; Johnson et al., 2002; O'Connor, Rasmussen, & Hawton, 2009; O'Connor, Rasmussen, Miles, & Hawton, 2009). In addition, a range of psychiatric disorders are associated with self-harm and suicidal behaviour (Hawton, K., Evans, & Weatherall, 2002; M.K. Nock et al., 2009), and the rate of mental health problems in children in care is high (Ford, Vostanis, Meltzer, & Goodman, 2007); 45% of children in care surveyed in the UK met criteria for mental health disorder (Meltzer, Gatward, Corbin, Goodman, & Ford, 2003). Furthermore, a lack of care placement security and/or permanency has been found to predict mental health problems (Tarren-Sweeney, 2008) and prevalence of psychiatric disorder is seen to be particularly high in young people with multiple recent changes of placement (Ford et al., 2007). Other psychological risk factors may play a role in self-harm in young people in care, such as attachments problems and impulsivity (e.g. Howe & Fearnley, 2003). It should however be noted that recent evidence suggests that a large proportion of looked-after children will have average or better performance in some domains of functioning (be that emotional health, cognitive ability or educational attainment) and cautions against over-generalising the level of difficulties experienced in this group (Rees, 2013).

Self-harm in Young People in Care

A handful of studies have examined self-harm in looked-after young people focusing largely on prevalence and profiles of self-harm, rather than social, psychological and clinical factors associated with the behaviour. A study of case note data relating to 80 children in the care of two local authorities in England reported high rates of self-harm (reported in 45% of cases), with seven recorded overdoses, 12 incidents of cutting and 17 other instances of self-harm

(Stanley et al., 2005). A small interview study of 38 young people presenting at hospital for self-harm in England (one-third of whom were currently or had been in care) found that, compared to those with no experience of being in care, looked-after young people were more likely to have started self-harming in childhood and to have previously presented at hospital for self-harm (Storey, Hurry, Jowitt, Owens, & House, 2005). More recently, a survey study of young people in care in Scotland found that 32% had self-harmed or thought about self-harming (Harkess-Murphy, Macdonald, & Ramsay, 2013). Taken together, these studies suggest that rates of reported self-harm in looked-after young people are higher than that estimated for young people in general (10 - 20%) (Doyle, Treacy, & Sheridan, 2015; Madge et al., 2008). However, these prevalence rates for self-harm in looked-after children and young people should be treated with caution given the small sample sizes and reliance in some studies on case-note or hospital presentation data.

Self-harm in the looked-after population should also be considered in a broader clinical context in which these young people are likely to experience mental health difficulties including depression and anxiety, but also complex attachment- and trauma-related symptomatology (Brunner et al., 2014; Tarren-Sweeney, 2013). Those who self-harm face multiple life events and problems including relationship, alcohol and mental health difficulties (Townsend, Ness, et al., 2016), which has implications for the development of clinical services for self-harm and also for developing research methodologies in the field. In recent years, the particular emotional needs of young people in care have started to be recognised at a clinical and policy level, and specialist Child and Adolescent Mental Health Services (CAMHS) for looked-after children have been developed. A study of one such specialist team found that a main reason cited for referral to their looked-after CAMHS team was self-harm (18%) along with disruptive behaviour (Callaghan, Young, Pace, & Vostanis, 2004). Research informing the key targets for intervention in self-harm in this group is

currently lacking. The current paper will build on this body of research by analysing in detail the patterns of thoughts, feelings, behaviours and events leading to self-harm in young people looked-after in public care who have self-harmed in the last six months.

Study Overview

The aim of this study was to describe and compare patterns of thoughts, feelings, events and behaviours experienced prior to self-harm, using sequence analysis of the Card Sort Task for Self-harm (CaTS). The CaTS and full details of the method of sequence analysis used are described elsewhere (Townsend, Wadman, et al., 2016). We compare patterns of factors reported as being important in leading to self-harm in a group of young people in care (looked-after group) and a group of young people who have never been in care (contrast group). This is of particular interest, because there may be important differences between the two groups in terms of risk factors, which could have important clinical implications for assessment and intervention. The CaTS has the advantage of allowing young people to identify factors relevant to their personal experience of self-harm and order them in a temporal sequence across six months, which captures the dynamic complexity of the myriad factors associated with self-harm. It also allows an examination of factors occurring in the hour leading to self-harm, which is a potentially important window for intervention. Indeed, a large European study of self-harm found that around half of young people had decided to harm themselves just in the hour before doing so (Madge et al., 2008). In the current study, sequence analysis is used to identify significant cross-dependencies between factors and to describe key transitions occurring prior to self-harm. There is increasing recognition for the need to systematically capture the more dynamic or temporal characteristics of self-harm, for example through micro-longitudinal research examining the influence of interpersonal contingencies on day-to-day self-harm (Turner, Cobb, Gratz, & Chapman, 2016) and the use of experiential sampling/momentary assessment in exploring dynamic changes in self-harm

and symptomatology (Nock, Prinstein, & Sterba, 2009). The CaTS task offers the potential to explore a large number of factors associated with this multidimensional and complex issue, from the young people's perspective (allowing young people to choose the factors they perceive are important to their self-harm). Understanding how young people felt in their 'self-harm' journey is vital, given the known discrepancy in perceived motivations for self-harm between service users and professionals (Hawton, Cole, O'Grady, & Osborn, 1982).

Method

Participants

Young people with experience of being in care of the State, aged 11-21 years (including care leavers), who had self-harmed in the past six months were eligible to take part in the study. The contrast group included young people also with history of self-harm in the past six months but no experience of being in care. Participants were recruited from 1) clinical services (CAMHS), 2) Children's Social Care and 3) community settings (self-harm support organisations, secondary schools and colleges) in the East Midlands region of England. Participants were also recruited more widely across England via social media. The number of participants recruited in each of these settings is given in Table 1.

Forty-five young people participated; 24 with experience of being looked-after in care (looked-after group – including eight care leavers) and 21 young people who had never been in care (contrast group). Previous published research utilizing sequence analysis has used samples of a similar size (Lawrence, Fossi, & Clarke, 2010).

Participants were given information sheets and the opportunity to ask questions, before giving informed consent to take part. Where appropriate, informed consent from parents, carers and social workers was also obtained (if the participant was under 16 years and subject to the requirements of individual social care orders). Ethical approval was granted

by the national Social Care Research Ethics Committee (as part of the NHS Health Research Authority) and the University department Research Ethics Committee.

Background Information

Demographic information (age, gender, ethnicity) was collected along with information about current education and/or employment status. Young people in the looked-after group were asked about the number and type of care placements they had experienced (e.g. foster care, residential care).

Self-harm

Participants were asked to report the methods of self-harm they had used (ever) by using an adapted checklist (Hawton et al., 2002). The participants reported the age at which they first self-harmed and the method used, and when they had most recently self-harmed and method used. The participants also self-reported any mental health diagnoses received from CAMHS.

Pre- and Post- Emotional State

Participants rated their current emotional state ("How are you feeling") before and after the research session on a visual analogue scale (VAS), with response options between 0- worst possible emotional state (illustrated with a sad face) and 10- best possible emotional state (illustrated with a happy face). In line with previous research addressing concerns that taking part in self-harm research may cause distress (Biddle et al., 2013), this scale was used to assess changes in emotional well-being in the course of the taking part in the research. A referral pathway to support participants was available from a qualified clinician.

Card Sort Task for Self-harm (CaTS)

The CaTS is a novel task developed to collect detailed information about thoughts, feelings, behaviours and events leading up to an episode of self-harm. Participants selected items relevant to a specified episode of self-harm from a set of 117 cards with thoughts, feelings, events, behaviours, self-harm supports/services and factors occurring after self-harm printed on them. Participants were asked to think about a specific self-harm incident (in this case, their first and most recent episode) and arrange cards that were important or significant in leading to that episode. Time stamp cards were provided (6 months before, 1 month before, 1 week before, 1 day before, 1 hour before, self-harm, afterwards) to allow participants to arrange the cards in chronological order along a six-month timeline. In the looked-after group, three participants did not complete the CaTS for their first episode of self-harm (two participants could not remember this episode sufficiently and one misunderstood) and one looked-after participant did not want to complete the CaTS for their most recent episode. The mean length of time spent completing the card sort task was 20 minutes in the looked-after group (range 5 to 35) and 22 minutes in the contrast group (range 15 to 40).

Analysis

Frequency analyses identified high frequency items to be included in the subsequent sequence analysis (this was done to reduce the complexity of the data analysis and diagrams; it would not have been feasible to have included all 117 items in the sequence analysis). The frequency cut-offs were determined by visually assessing the slope of the card frequencies plots (similar to a scree plot used in factor analysis) and identifying distinct changes in the gradient of the plots, thus dividing the cards by high-, medium- and low frequency cut-off points (Townsend, Wadman, et al., 2016). As such the frequency cut-off points vary for each group (LAC versus contrast), and for first versus most recent self-harm. The items included in the frequency-filtered sequence analysis were the high frequency items (see Tables 3 and 4) and the pooled medium and low frequency item(s) (as single items). The time stamp cards

"6 months before" and "I self-harmed" were also included in the sequence analysis as key time-points (the remaining time cards were omitted from the analysis in order to limit the number of items included in the analyses).

In the sequence analysis, the frequency of each possible two-item (antecedent – sequitur; A→B) pairing were tabulated in a transition frequency matrix; a two-way contingency table, with antecedent cards (lag 0) in rows and sequitur cards (lag 1) in columns. The sequence analysis determined whether given a particular antecedent event, a subsequent event occurs more or less often than would be expected by chance. Chi-squared analysis provided a statistical test of cross-dependency and standardised normal residuals (SNRs) over the critical value of 2.0 indicated significant interdependence or transitions between two factors, that is, the likelihood of an item pairing occurring was significantly above what is expected by chance (Bakeman & Gottman, 1997; Colgan & Smith, 1978). Chi-squared analysis and SNRs have been similarly used to determine sequential patterns in data in recent studies utilising sequence analysis, and state transition diagrams are a recognised way of presenting sequence analysis findings (e.g. Keatley, Barsky & Clarke, 2017; Lawrence, Fossi, & Clarke, 2010; Taylor, Keatley & Clarke, 2017).

State Transition Diagrams

The significant transitions occurring between items (where SNRs > 2.0) in the self-harm sequences for LAC first episode, contrast first episode, LAC most recent episode and contrast most recent episode are presented in four state transition diagrams (Figures 1 to 4 respectively). Arrows represent links between two items (A→B) which reached the critical value, representing two factors which are perceived as sequentially related, that is, B followed A more frequently than would be expected by chance, if no sequential pattern existed in the data (Bakeman & Gottman, 1997). For example, in Figure 1 we can see that "*I*

felt better after self-harm" followed "*I self-harmed*" in the card sort sequence more frequently than expected by chance (SNR = 4.1, see Table S1 in the supplementary materials). Transitions with larger SNRs are indicated by wider arrows and the SNRs are also given in the tables in the supplementary materials. Note that only items with significant transitions in the sequence analysis are included in the state transition diagrams, and this includes the pooled 'medium frequency item(s)' and 'low frequency item(s)' as single items. Only the time stamp cards for '6 months before' and 'I self-harmed' are included in the diagrams, and only when they shared a significant transition with another item.

Participant Characteristics

The looked-after group were aged between 14 and 21 years (M = 16.79) and the contrast group were aged between 13 and 21 years (M = 17.19). There were four male participants in the looked-after group and two in the contrast group. The majority of participants in the looked-after group (75%) and the contrast group (81%) were White British. Most participants were in further education (looked-after group 58.3%, contrast 47.6%), followed by secondary school (looked-after group 29.2%, contrast group 47.6%) and university (looked-after group 4.2%, contrast group 28.3%). Two participants in the looked-after group were unemployed and one member of the contrast group was in employment.

Care Placements

The majority of looked-after participants (66.7%) reported first becoming accommodated in care between the ages of 13 and 15 years, with the remainder reporting first being accommodated in care between the age of 0 and 9 years (29.2%, data missing for one participant). Half of the looked-after group had lived in between two and five care placements, 25.0% had just one placement and the remaining 25.0% reported having six or more placements. The looked-after group included 16 looked–after young people (ten in

residential care homes, five in foster care homes and one in supported accommodation) and eight care leavers (two in foster care homes, one in supported accommodation, two living with biological parents(s) and three living independently). Details on the participants' legal status with regard to care orders were not available.

Results

Self-harm Type, Frequency and Onset

The age of first self-harm ranged between 7 and 16 years (M = 12.31) in the looked-after group and 10 and 15 years (M = 12.74) in the contrast group. On average, both groups had been self-harming for more than four years (looked-after group: range 1 to 13 years, M = 4.48; contrast group: range 1 to 10 years, M = 4.45). When asked about frequency of self-harm, most participants reported multiple episodes that fluctuated in frequency over the years, rather than providing an exact number of episodes. The self-harm methods that participants reported they had ever used are given in Table 2. The majority of participants in both groups reported self-cutting as a method that they had ever used (looked-after group, 95.8%; contrast group, 85.7%).

When methods of self-harm reported for first and most recent episodes of self-harm were compared, most participants reported cutting or scratching for both episodes (looked-after group 75.0%, contrast group 71.4%). One participant in the looked after group and one participant in the contrast group reported an overdose for both their first and most recent episodes of self-harm. Cutting/scratching at first episode followed by overdose/ligature for most recent episode was reported by two looked-after participants and three contrast participants.

Around half the participants self-reported having received a diagnosis of a mental health condition (54.2% in the looked-after group and 47.6% in the contrast group), including depression, anxiety and eating disorders.

Frequency Analysis

We identified the most frequently used items in the CaTS, for the first and the most recent episodes of self-harm in the looked-after group and the contrast group. The remaining items were pooled as "medium frequency" and "low frequency". This allowed us to best capture the heterogeneity in the data whilst making the data analysis, interpretation and presentation manageable. The high frequency items used by the looked-after and the contrast group are shown in Table 3 (first episode of self-harm) and Table 4 (most recent episode of self-harm).

For the first and most recent episodes of self-harm, feelings of depression, sadness and self-hatred were frequently reported by both groups, although the young people also indicated that they could not tell anyone how they were feeling. Prior to the first time they self-harmed, many participants from both groups reported that they were not able to sleep and that they isolated themselves. The looked-after young people also frequently selected the items "I had access to the means to hurt myself" and "I felt better after self-harm", whereas the contrast group reported more negative thoughts and feelings prior to their first episode of self-harm.

For the most recent episode of self-harm, feeling depressed and sad was the most frequently reported item, and self-hatred and isolation were also common to both groups. Young people in the contrast group again reported more negative thoughts and feelings that are possibly indicative of a depressive episode; burdensomeness, hopelessness, worthlessness and unbearable mental pain. The looked-after young people reported feeling that they could

not escape and not being afraid of death, along with access to means and the impulsiveness of the act of self-harm.

Sequence Analysis of First Self-harm Episode

The first episode self-harm sequences were analysed separately for the looked-after group and the contrast group using lag sequence analysis. The items included in the analysis were the high frequency items, the pooled medium and low frequency item(s) and the "6 months before" and "I self-harmed" time stamps.

A chi square test indicated that the observed frequencies of consecutive card pairs (two-factor transitions) in the looked-after group data strings were significantly different from that expected by chance: χ^2 (100) = 253.56, p <.001. Significant transitions in the sequences of first episode of self-harm in the looked-after group are given in Figure 1 (see also Table S1 in the supplementary materials). Medium frequency items preceded self-harm indicating a range of different factors were reported immediately prior to the first self-harm episode. Items with significant transitions to these medium frequency items were having access to means, and feeling depressed and sad. Looked-after young people also reported feeling better immediately after self-harm.

Figure 2 shows the significant transitions in sequences describing the first episode of self-harm in the contrast group (Table S2 in the supplementary materials). The chi-square test was significant indicating that the observed frequency of two-factor card transitions in the data was significantly different to that expected by chance: χ^2 (144) = 288.11, p <.001. As with the looked-after group, a variety of medium frequency items immediately preceded self-harm. In the case of the contrast group, feeling worthless preceded these medium frequency items prior to self-harm, and anger was associated with worthlessness. A transition from depression and not knowing what to do, to feelings of self-hatred was also noted. The

transition from not trusting anyone and not telling anyone suggests that young people are keeping these negative feelings to themselves. There was also a behavioural transition from sleep problems to isolating the self from others.

Sequence Analysis of Most Recent Self-harm Episode

Sequence analysis of the most recent self-harm sequences indicated that the observed frequency of two-factor transitions was significantly different to that expected by chance in the looked-after group data (χ^2 (144) = 349.17, p <.001) and the contrast group data (χ^2 (144) = 348.64, p <.001). The significant transitions for the looked-after and the contrast group are given in the supplementary materials (Table S3 and Table S4 respectively).

The significant transitions in the sequences for the most recent episode of self-harm in the looked-after group are presented in Figure 3. Acting impulsively and not fearing death are reported immediately prior to self-harm, and having access to means and self-hatred occur just prior to acting impulsively to self-harm. Relevant factors reported up to six months before the self-harm are more heterogeneous, with low frequency items at six months leading to medium frequency items. These medium frequency items are linked to not being able to tell anyone about their feelings, along with feelings of depression and sadness. Generally, there were more significant transitions between a larger number of factors reported by the looked-after young people in relation to their most recent self-harm as compared to the first episode.

Figure 4 shows the significant transitions for most recent self-harm in the contrast group. Feelings of depression and sadness are notably reported at six months prior to self-harm, and these transition to self-hatred, followed by worthlessness, which has a significant transition to unbearable mental pain. Isolating oneself was also a key factor and occurred after a range of different factors (medium frequency and low frequency items). No significant

transitions immediately to self-harm emerged. Note that the transition to self-harm (from medium frequency item(s)) did not reach criterion but, as the immediate transition to self-harm is of key interest, it is represented in the state transition diagram as a broken line.

Emotional State Before and After the CaTS

The mean score on the emotional state VAS for the looked-after group before the session was 6.77 (*SD* = 2.02), and at the end of the session was 6.60 (*SD* = 1.83). The mean score for the contrast group before the session was 6.40 (*SD* = 2.11) and afterwards was 6.79 (2.03). Thus, scores were similar and towards the positive end of the scale. A significant change in emotional state after completing the CaTS was not indicated in either the looked-after group (t (23) = 0.65, p = .53) or the contrast group (t (20) = -1.42, p = .17).

Discussion

Feelings of depression, sadness and self-hatred were frequently identified as important factors leading to self-harm (first and most recent episodes) by looked-after young people and young people with no experience of being in care. The prominence of negative emotions is notable, and in line with existing research on the function of self-harm as emotional regulation (Klonsky, 2009). Negative emotions were quite prominent in the most frequently used items in the self-harm sequences. A study using Ecological Momentary Assessment in young people with a history of NSSI found that individuals who reported self-injury during the study experienced increased negative affect prior to an episode of NSSI, and these changes in affect were apparent hours beforehand (Armey, Crowther, & Miller, 2011). Emphasising the emotional distress associated with self-harm is important, particularly given the 'attention-seeking' stigma potentially surrounding self-harm amongst caregivers and professionals (Law, Rostill-Brookes, & Goodman, 2009).

For both episodes of self-harm, the contrast (not in care) group reported a wider range of negative thoughts and feelings than the looked-after (in care) group. It may be that young people in care remember their self-harm episodes in less detail, have difficulties in identifying and labelling different emotions, or find it intolerable to think about or share their internal emotional world. In comparison, young people with no experience of being in care described unbearable emotional pain, worthlessness and burdensomeness. A recent qualitative analysis of young people's online discussion about attending emergency departments for self-harm found that feelings of guilt, self-loathing and unworthiness were experienced, and that such feelings may prevent young people from seeking healthcare help (C. Owens, Hansford, Sharkey, & Ford, 2016).

Patterns of Self-harm in Young People in Care (Looked-after Young People)

The frequency analyses highlighted those factors that young people commonly reported as important in leading to self-harm. Sequence analysis allowed us to determine significant patterns in how thoughts, feelings, behaviours and events unfold over time in relation to an episode of self-harm. The sequence analysis of the first episode of self-harm in the looked-after group indicates that a range of medium frequency factors immediately preceded their first episode of self-harm. These heterogeneous factors are in turn preceded by having access to means; a salient issue for young people in care. Future research with larger samples of young people in care would allow further unpicking of this heterogeneity of factors immediately before self-harm.

The state transition diagram for the most recent episode of self-harm in looked-after young people reveals some concerning patterns prior to self-harm. Not fearing death and acting on impulse were reported immediately proximal to self-harm, with access to means preceding impulsivity. These patterns map onto two contemporary models of suicidal

behaviour. Firstly, having access to means and acting on impulse are regarded as factors associated with acting upon thoughts of suicide in the volitional phase of the integrated motivational-volitional model of suicidal behaviour (O'Connor, 2011). Adults who attempt suicide differ from those with suicidal thoughts in terms of fearlessness about death and impulsivity, as well as exposure to suicidal behaviour (Dhingra, Boduszek, & O'Connor, 2015). Furthermore, the emergence of fearlessness of death in more recent episodes of self-harm fits with the concept of acquired capability (that is, overcoming the natural instinct to stay alive and to engage with suicidal behaviours) in the interpersonal theory of suicidal behaviour (Joiner, 2005; Joiner et al., 2009).

Looked-after young people reported feeling better after the first episode of self-harm but by their most recent episode they reported that they were not afraid to die. This is important: just because a young person initially indicates they self-harm to feel better does not mean that their motivations (including possible intention to die or not worrying about the possibility of accidental death in the process) will not change over time. Thus, young people in care should undergo regular monitoring and assessment of each self-harm episode. conducted in line with evidence-based guidance (e.g. National Collaborating Centre for Mental Health commissioned by the National Institute for Health and Clinical Excellence, 2011). Moreover, appropriate support should be arranged early. Recent Cochrane reviews have shown that Dialectical Behavioural Therapy and Mentalisation Therapy may be helpful for young people who self-harm (Hawton et al., 2015), and that for those over the age of 18 years short-term Cognitive Behavioural Therapies help prevent repetition of self-harm and reduce symptoms of depression, hopelessness and suicide ideation (Hawton et al., 2016).

The reported access to means by young people in care, combined with the developing fearlessness of death, have implications for social care practice. Restricting access to means to self-harm is recommended, particularly if suicide ideation is present (Cole-King, Green,

Gask, Hines, & Platt, 2013). Thus, looked-after young people's access to potentially lethal means to self-harm should be restricted, if the young person has repeated self-harm and appears to be overcoming their fear of death. The care environments that young people can be placed in are diverse (foster, residential, secure and custodial, or care by family and friends) and restricting access to means is not without challenges, with difficulties with high turnover of staff in residential homes and potential tensions with the goal of developing a sense of belonging or 'normality' in care (Colton & Roberts, 2007).

Patterns of Self-harm in Young People Not in Care

The first episode of self-harm in young people not in care was somewhat similar to that of looked-after young people, with a variety of (medium frequency) factors immediately prior to self-harm. Feelings of worthlessness and anger were reported before these most proximal and varied factors. There was also a behavioural transition apparent prior to self-harm, whereby the young people have problems sleeping and isolate themselves from others. Adolescents with sleep difficulties are significantly more likely to report self-harm than adolescents without sleep problems (Hysing, Sivertsen, Stormark, & O'Connor, 2015), and social isolation is associated with self-harm and is a barrier to help-seeking (Wu, Chang, Huang, Liu, & Stewart, 2013). This is a pattern that could signal that a young person is having difficulties, and is thus a point to intervene and encourage help-seeking (bearing in mind the significant transition between mistrust and not telling anyone about their emotional distress). Using the CaTS in clinical settings could help young people broach the topic of self-harm and begin to communicate their emotional distress.

For most recent self-harm in the contrast group, feelings of depression and sadness were notable at six months prior to self-harm. Other negative emotions were subsequently described in the sequences over time, with a final transition to unbearable mental pain. Thus,

young people with no experience of being in care appear to report a range of negative emotions months prior to self-harm. This raises the possibility that for a substantial period of time, young people are coping with extreme emotional distress, and possibly a depressive episode, without turning to self-harm. Future research could usefully examine what factors may play a role in delaying self-harm in this way.

Limitations

The transitions mapped out in the state transition diagrams represent significant cross-dependencies between two items as antecedent – sequitur pairings only. Any longer sequences apparent in the first-order sequence diagrams must be interpreted with caution. We cannot state with confidence that a three-factor sequence A→B→C exists in the data, only that the inter-dependence between A→B and B→C are significant. Larger samples are needed to provide sufficient data to explore longer sequences of factors, and would likely be illuminating. Larger samples would also allow for more items to be included in the sequence analyses and to further unpick the role of key factors (such as access to means and feeling better after self-harm) in relation to self-harm. For example, a larger sample would allow us to explore notable sequences occurring prior to self-harm at the specific time-points (e.g. one month/week/day/hour before self-harm).

The completion of the CaTS relied on retrospective recall of specific episodes of self-harm, some of which occurred several years prior to the task. The CaTS is in the early stages of development and further research could seek to address this issue by, for example, collecting confidence ratings of accuracy of recollections of self-harm episodes or by consulting clinical notes. Participants in the present study were recruited from a range of settings and as such constitute quite heterogeneous groups (both looked-after and contrast). Detailed data regarding the care histories of the looked-after participants and, importantly,

exposure to early adversity including maltreatment was not available (in some cases the relevant services were unwilling to share this information despite appropriate ethical and governance approvals being in place, and also some participants self-referred themselves to the study from community settings). Furthermore, clinical information (e.g. diagnoses and interventions received) was self-reported. Future research utilising the CaTS would benefit from recruiting a larger sample of clinical participants in a more systematic way (e.g. a rolling recruitment strategy) in order to have a focused clinical sample and confirmation of relevant clinical and social care data. In addition, this recruitment strategy would allow us to further stratify the sample and better assess possible impacts of care histories, clinical diagnosis, potential sampling bias and the characteristics of non-responders.

There has been very little targeted research examining mental health and wellbeing in young people in public care. Significant barriers to improving evidence-based mental health care for looked-after young people have been reported and include frequent changes of placement, changes in social workers and lack of inter-agency cooperation (Richardson & Lelliott, 2003). Recruiting participants though Children's Social Care was a significant challenge for the present study, as evidenced by the recruitment figures in Table 1. Steps were taken to address the widespread concern regarding the potential detrimental effect of taking part in self-harm research on a young person's well-being. Previous research has found that asking questions about self-harm does not lower mood (Biddle et al., 2013). The pre- and post-emotional state ratings taken in our study also suggest the participants did not experience a change in well-being through taking part in the research.

Conclusions

Sequence analysis of data generated with the novel CaTS uncovered a number of important patterns in self-harm. Although young people in care felt better immediately

following their first episode of self-harm, this functionality did not remain after years of repeated self-harm. Young people looked-after in care reported access to means, fearlessness of death and impulsivity immediately proximal to recent self-harm. This is of particular concern as these factors accord with contemporary models of suicidal behaviour. Thus, all self-harm episodes should be taken seriously and restricting access to lethal means in looked-after young people showing these patterns of thoughts and feelings is recommended. Difficult negative emotions were salient to self-harm in young people in care and young people with no experience of being in care, although the latter reported a greater range of negative emotions and significant transitions or shifts between them. For their most recent episode of self-harm, young people with no experience of being in care reported feelings of depression and sadness as early as six months prior to self-harm, thus suggesting some ability to delay self-harm despite emotional distress. The CaTS allowed the young people to convey the sheer emotional distress they experienced over the months, weeks, days and hours leading to self-harm and the dynamic interplay of emotion with thoughts, events and behaviours. Early recognition and timely support focused on alleviating and coping with difficult negative emotions is required for these young people.

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Table 1. Number of participants recruited from clinical service, social services and in the community

Recruitment setting	**Looked-after group % (*n*)**	**Contrast group % (*n*)**
Clinical services (CAMHS)	33.3% (8)	33.3% (7)
Children's Social Care	25.0% (6)	0.0% (0)
Community (including online)	41.7% (10)	66.7% (14)
Total group size *n*	24	21

Table 2. Self-harm methods (ever used) reported by participants

Self-harm method (ever used)	**Looked-after group % (freq)**	**Contrast group % (freq)**	**Total % (freq)**
Cutting	95.8% (23)	85.7% (18)	91.1% (41)
Overdose	62.5% (15)	57.1% (12)	60.0% (27)
Scratching	41.7% (10)	47.6% (10)	44.4% (20)
Punching self or a wall/window	37.5% (9)	28.6% (6)	33.3% (15)
Banging head	25.0% (6)	38.1% (8)	31.1% (14)
Burning	20.8% (5)	42.9% (9)	31.1% (14)
Biting	29.2% (7)	19.0% (4)	24.4% (11)
Preventing wounds from healing	20.8% (5)	23.8% (5)	22.2% (10)
Sticking sharp objects into self	16.7% (4)	23.8% (5)	20.0% (9)
Pulling out hair	12.5% (3)	19.0% (4)	15.5% (7)
Rubbing glass on to skin	12.5% (3)	9.5% (2)	11.1% (5)
Poisoning self	8.3 (2)	14.3% (3)	11.1% (5)
Rubbing sandpaper over skin	0% (0)	0% (0)	0% (0)
Using bleach to scrub skin	0.0% (0)	0.0% (0)	0% (0)
Breaking bones	0.0% (0)	0.0% (0)	0% (0)
Other	29.2% (7)	28.6% (6)	28.9% (13)

Table 3. High frequency items describing first episode of self-harm

Looked-after group		Contrast group	
Item/card	**Frequency**	**Item/card**	**Frequency**
I could not tell anyone how I was feeling	16	I felt depressed and sad	19
I isolated myself from others	15	I hated myself	17
I felt depressed and sad	13	I felt worthless	15
[a]I had access to the means to hurt myself	13	I could not trust anyone	14
I hated myself	11	I could not tell anyone how I was feeling	14
I was not able to sleep	11	I could not think of anything else to do	13
[a]I felt better after self-harm	11	I was angry	13
		I was not able to sleep	13
		I isolated myself from others	13

[a]High frequency items unique to looked-after group

Note. The item 'I felt better after self-harm' fell just below the threshold for high frequency items in the contrast group (frequency 12) and 'I had access to the means to hurt myself' was a medium frequency item for the contrast group (frequency 9).

Table 4. High frequency items describing most recent episode of self-harm

Looked-after group		Contrast group	
Item/card	**Frequency**	**Item/card**	**Frequency**
I felt depressed and sad	19	I felt depressed and sad	19
[a]I could not tell anyone how I was feeling	18	I felt like a burden on people	17
[a]I was not able to sleep	16	I felt very hopeless about the future	17
I isolated myself from others	16	I hated myself	16
[a]I felt I could not escape from feelings or situations	15	The mental pain was unbearable	15
[a]I did it on impulse without planning	15	I felt worthless	15
[a]I was not afraid of death	14	I isolated myself from others	15
I hated myself	13	I could not think of anything else to do	14
[a]I had access to the means to hurt myself	13	I felt exhausted	14

[a]High frequency items unique to looked-after group

Note. The item 'I felt better after self-harm' was used with medium frequency in both groups (LAC group frequency 12; contrast group frequency 7). The 'access to means' item was just below threshold frequency for the contrast group (13).

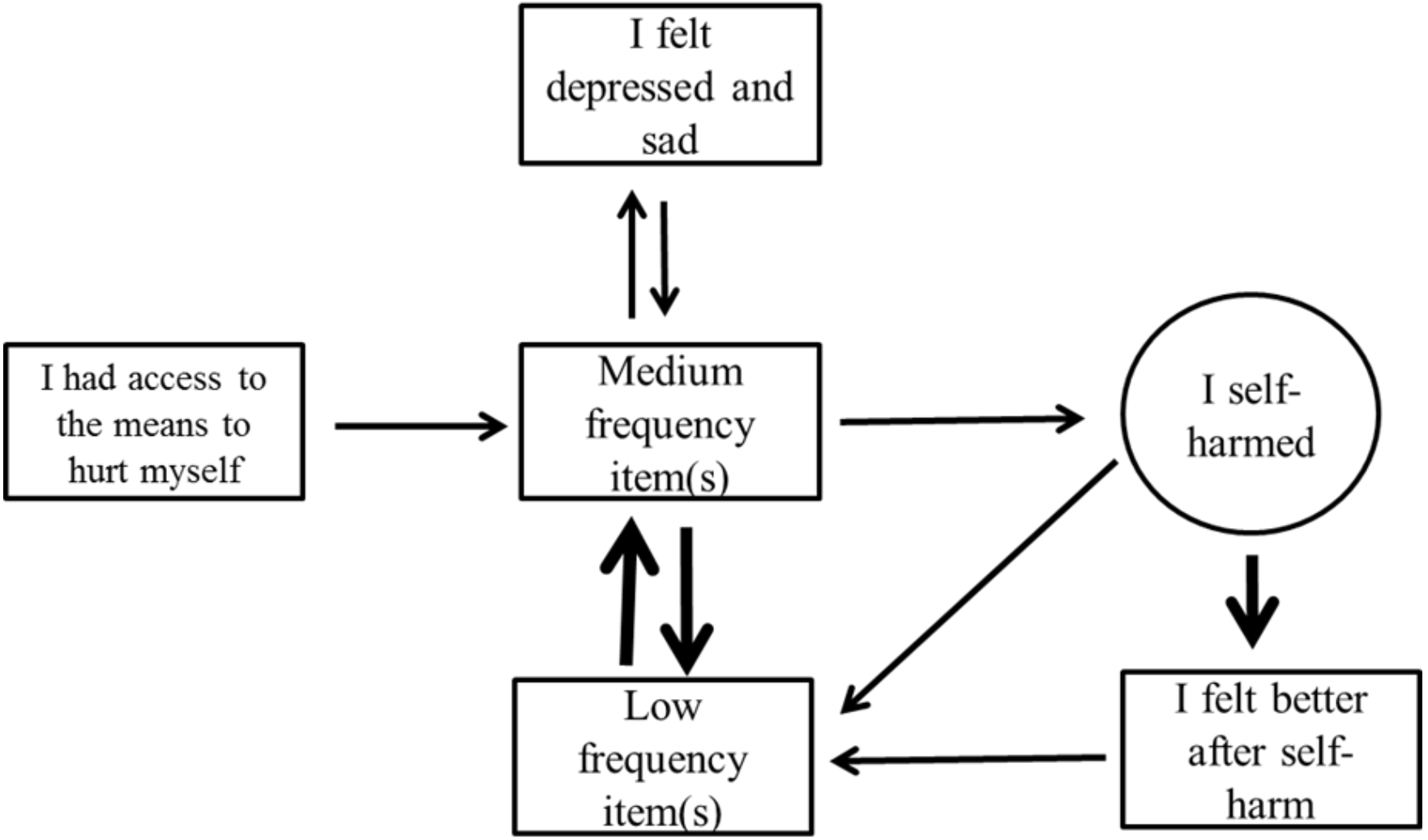

Figure 1. State transition diagram describing first episode of self-harm in looked-after group

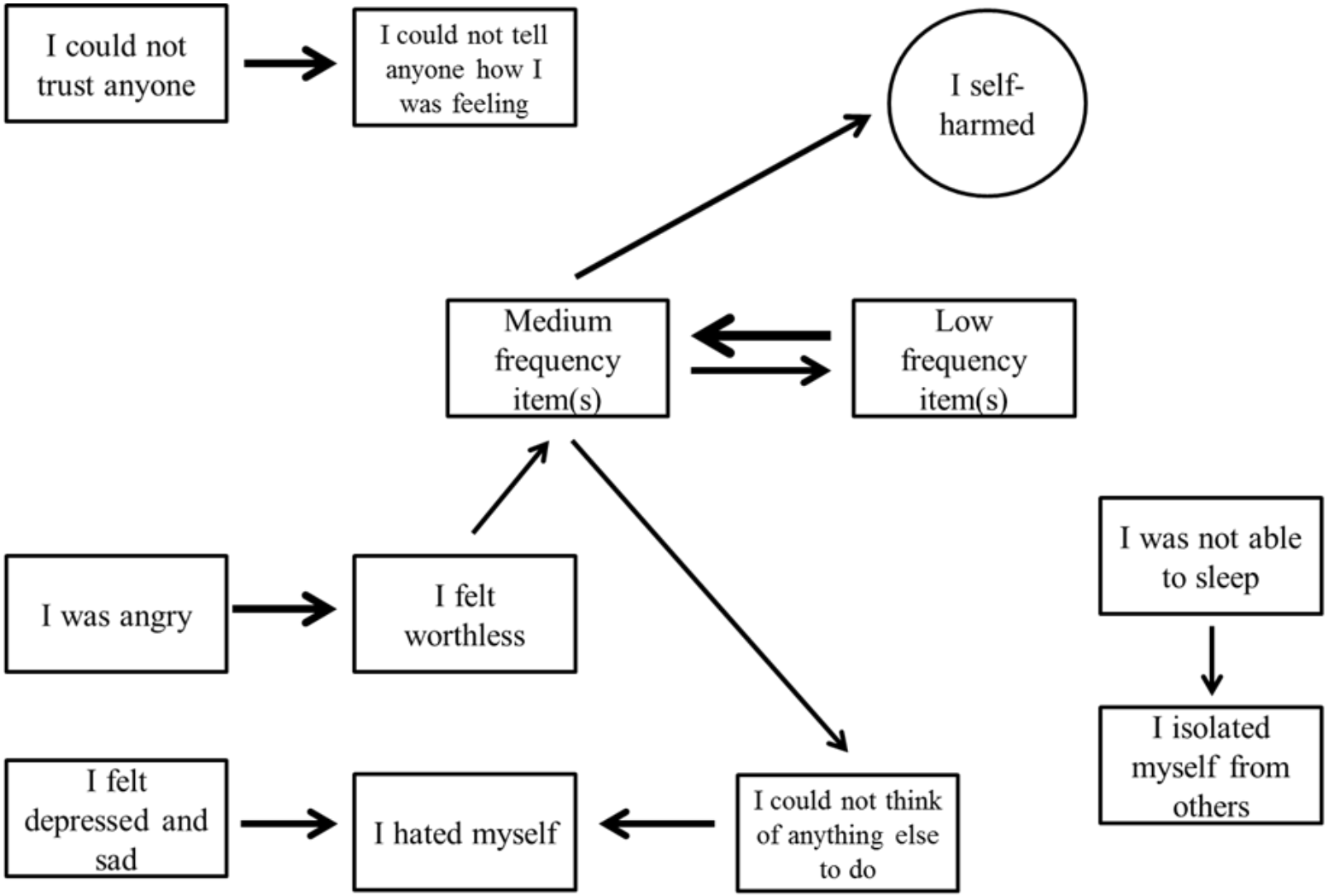

Figure 2. State transition diagram describing first episode of self-harm in contrast group

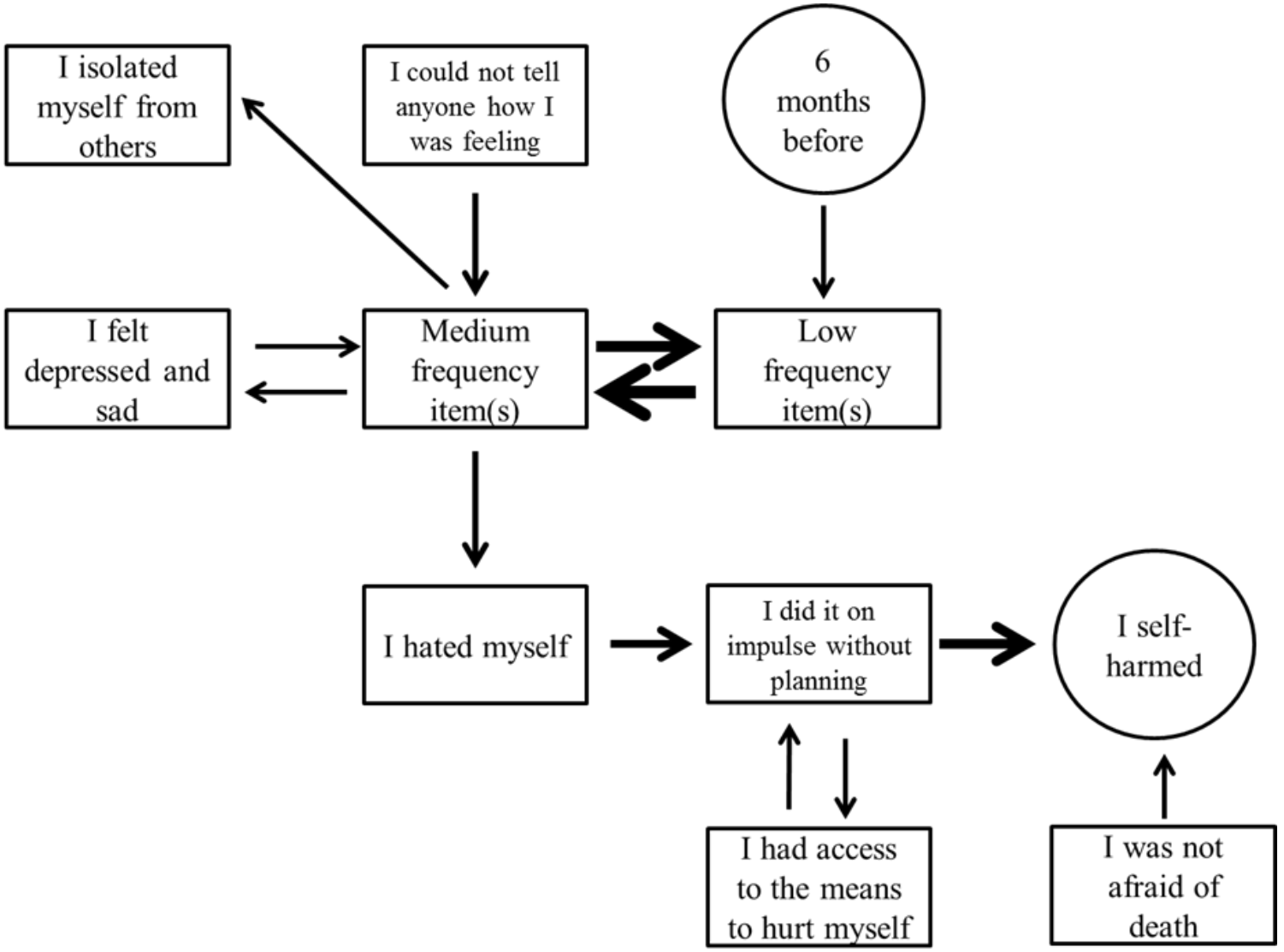

Figure 3. State transition diagram describing most recent episode of self-harm in looked-after group

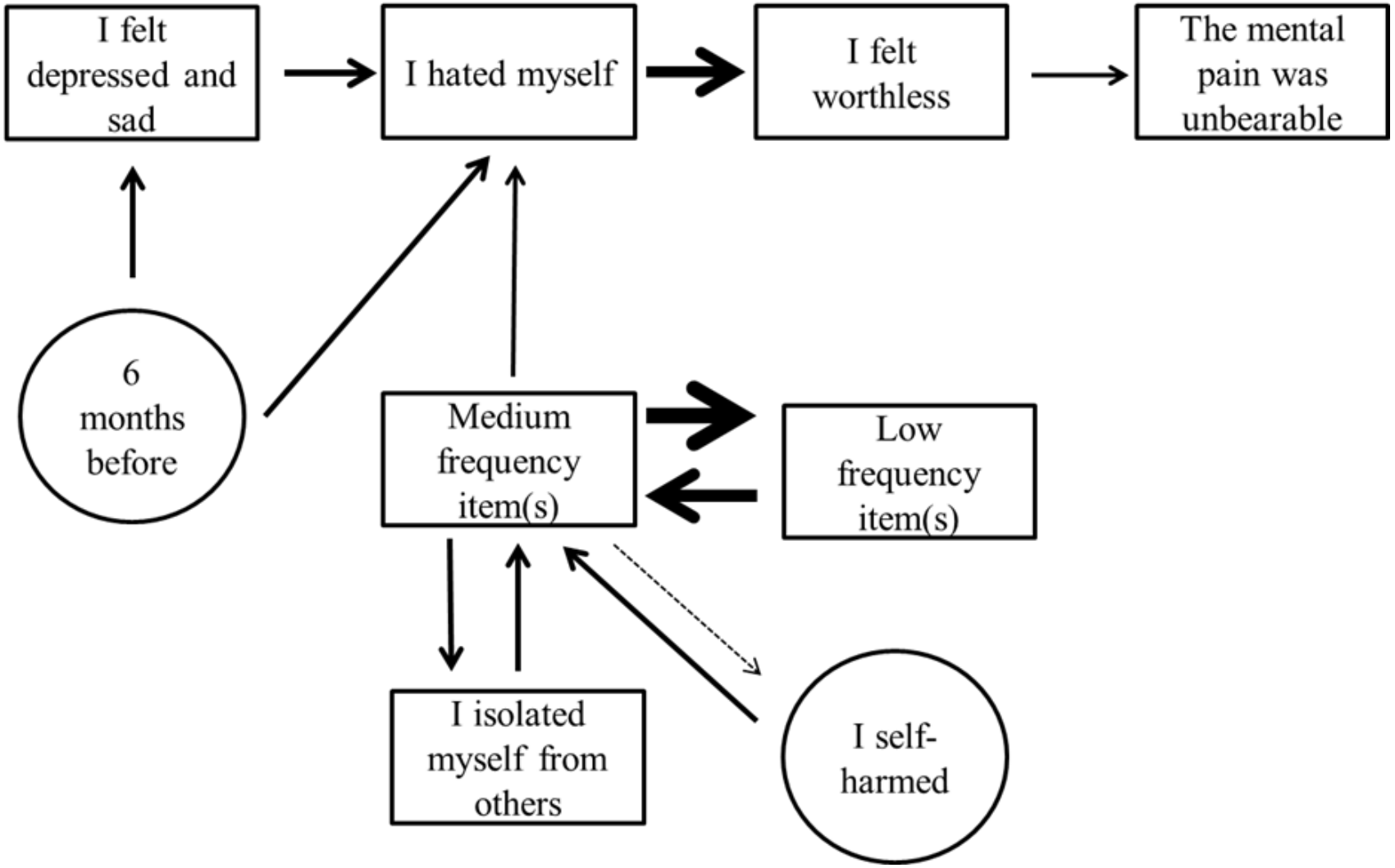

Figure 4. State transition diagram describing most recent episode of self-harm in contrast group

Table S1. Significant two-item transitions for first episode of self-harm in looked-after group

Antecedent	**Sequitur**	**Standardised residual >2**
Low frequency item(s)	Medium frequency item(s)	4.7
Medium frequency item(s)	Low frequency item(s)	4.3
I self-harmed	I felt better after self-harm	4.1
I felt depressed and sad	Medium frequency item(s)	2.6
I had access to the means to hurt myself	Medium frequency item(s)	2.6
Medium frequency item(s)	I self-harmed	2.5
I self-harmed	Low frequency item(s)	2.4
I felt better after self-harm	Low frequency item(s)	2.3
Medium frequency item(s)	I felt depressed and sad	2.3

Table S2. Significant two-item transitions for first episode of self-harm in contrast group

Antecedent	**Sequitur**	**Standardised residuals (> 2)**
Low frequency item(s)	Medium frequency item(s)	5.0
I could not trust anyone	I could not tell anyone how I was feeling	3.8
I was angry	I felt worthless	3.8
I felt depressed and sad	I hated myself	3.4
Medium frequency item(s)	Low frequency item(s)	3.4
I could not think of anything else to do	I hated myself	3.2
Medium frequency item (s)	I self-harmed	2.9
I was not able to sleep	I isolated myself from others	2.4
Medium frequency item(s)	I could not think of anything else to do	2.4
I felt worthless	Medium frequency item(s)	2.3

Table S3. Significant two-item transitions for most recent episode of self-harm in looked-after group

Antecedent	**Sequitur**	**Standardised residuals (>2)**
Low frequency item(s)	Medium frequency item(s)	6.0
Medium frequency item(s)	Low frequency item(s)	5.1
I did it on impulse without planning	I self-harmed	4.7
I hated myself	I did it on impulse without planning	3.8
I could not tell anyone how I was feeling	Medium frequency item(s)	3.1
Medium frequency item(s)	I hated myself	2.8
I was not afraid of death	I self-harmed	2.6
Medium frequency item(s)	I isolated myself from others	2.5
I did it on impulse without planning	I had access to the means to hurt myself	2.3
I had access to the means to hurt myself	I did it on impulse without planning	2.3
6 months before	Low frequency item(s)	2.3
I felt depressed and sad	Medium frequency item(s)	2.2
Medium frequency item(s)	I felt depressed and sad	2.2

Table S4. Significant two-item transitions for most recent episode of self-harm in contrast group

Antecedent	**Sequitur**	**Standardised residuals (> 2)**
Medium frequency item(s)	Low frequency item(s)	6.5
Low frequency item(s)	Medium frequency item(s)	5.5
I hated myself	I felt worthless	5.0
I felt depressed and sad	I hated myself	2.9
I isolated myself from others	Medium frequency item(s)	2.5
6 months before	I hated myself	2.5
Medium frequency item(s)	I isolated myself from others	2.3
6 months before	I felt depressed and sad	2.3
I self-harmed	Medium frequency item(s)	2.3
I felt worthless	The mental pain was unbearable	2.1
Medium frequency item(s)	I hated myself	2.1
Medium frequency item(s)	*I self-harmed*	*1.1*

Note. The transition to self-harm (from medium frequency item(s)) did not reach SNR criterion. As the transition to self-harm is of key interest, it is represented in the state transition diagram as a broken line.