Entrapment and suicide risk: the development of the 4-item Entrapment Scale Short-Form (E-SF)

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Abstract

Evidence suggests that suicidal behaviour arises from one's attempt to escape from unbearable situations or unbearable thoughts and feelings. These feelings of entrapment are usually assessed via the 16-item Entrapment Scale, but this is too long for routine use in clinical practice. The aim of this study was to develop a brief version of the full scale that reliably assesses entrapment. We used data collected from a clinical sample (n = 497) of patients following hospital-treated self-harm and a population-based sample (n = 3457) of young adults**.** Four items were selected that had both the highest factor loading and discriminatory parameters and that covered the theoretical constructs of internal and external entrapment. Correlations between the 4-item short-form and the 16-item full scale were nearly perfect (0.94 for the clinical sample, 0.97 for the population-based sample). When comparing the correlations between the short-form and the full scale with other clinical and psychological scales, the correlations were nearly identical. The 4-item Entrapment Scale Short-Form (E-SF) will provide very comparable information about entrapment for each respondent as the full scale will do. However, its brevity will increase the likelihood that the assessment of entrapment will be implemented into everyday clinical practice.

Keywords: suicide; entrapment; assessment; item response analysis

Background

Suicide is a global public health problem with an estimated 800,000 people dying by suicide across the world each year and at least 20 times that number attempting suicide (World Health Organization, 2014). Suicidal thoughts are even more common, with a recent national study finding that more than 20% of young adults reported that they had thought about suicide at some stage in their lives (O'Connor et al., 2018). Epidemiological studies have also identified many different risk factors such as gender, mental illness, and social status (Hawton & van Heeringen, 2009). In the last decade, however, there has been a concerted focus on the psychological factors that play a role in the development of suicide ideation and suicide attempts (O'Connor & Nock, 2014).

One such factor that has received considerable attention is entrapment. Entrapment, which can be internal or external in nature, is posited to arise when one's attempts to escape from defeating or humiliating circumstances are blocked (Gilbert & Allan, 1998). It is argued that suicidal behaviour arises from one's attempt to escape from unbearable situations (external entrapment), or from unbearable thoughts and feelings (internal entrapment) (O'Connor & Portzky, 2018; Williams, 1997). Entrapment is also central to the integrated motivational-volitional model (IMV) of suicidal behaviour, a tripartite framework which builds upon Williams' work on defeat and entrapment (Williams, 1997); indeed entrapment is theorised to be the key driver of suicidal behaviour (O'Connor & Kirtley, 2018). Given this evidence, clinicians ought to be aware of its relevance in clinical assessment and, where relevant, focus on entrapment as a treatment target among individuals at high risk of suicide (O'Connor & Portzky, 2018). Indeed, specifically targeting feelings of entrapment, and monitoring levels of entrapment over time offers a potentially novel direction for therapeutic interventions. The key challenge, therefore, is how best to assess entrapment.

The assessment of entrapment

Most entrapment and suicidal behaviour studies employ the 16-item Entrapment Scale to assess levels of entrapment (Gilbert & Allan, 1998; Taylor, Wood, Gooding, Johnson, & Tarrier, 2009). This scale, which consists of two subscales (internal and external entrapment), was developed to assess

entrapment within depressed samples (Gilbert & Allan, 1998). However, to be useful in clinical settings, especially when administered repeatedly in consecutive sessions with vulnerable individuals, a 16-item scale is simply not feasible. Consequently, the aim of this study was to develop a brief version of this scale tailored for use with those at elevated risk of suicide. Such a scale would also be of considerable benefit to researchers who are exploring the aetiology and course of suicide risk.

In this study, we employed different psychometric techniques from both classical test theory (CTT) and modern test theory (item response theory: IRT) (Edelen, Reeve, Orlando, Ae, & Reeve, 2007) to develop a short-form version of the Entrapment Scale (E-SF). While CTT identifies basic properties of the data such as eigenvalues and factor loadings, IRT provides more detailed information at the item level. Both techniques complement each other when developing short scales (Edelen et al., 2007). We aimed to develop a four-item scale that measures both internal and external entrapment with two items for each subscale. Internal entrapment relates to the concept of Baumeister's escape from self (Baumeister, 1990). One wants to escape from inner feelings and thoughts. External entrapment refers to situations or people in the outside world that trigger motivation for escape. Although psychometric evaluations mostly find that a one factor model is the best fit for the Entrapment Scale (Forkmann, Teismann, Stenzel, Glaesmer, & De Beurs, 2018; Griffiths et al., 2015), both internal and external entrapment have been found to be uniquely related to suicidal behaviour (de Beurs, Fried, et al., 2018; O'Connor & Portzky, 2018). Additionally, a study that used network analysis, a novel statistical technique that can better find clusters within highly correlated data, indeed found that internal and external entrapment formed separate clusters (Forkmann, Teismann, Stenzel, Glaesmer, & de Beurs, 2018). We decided upon four items for the brief scale, with two items for each part of the scale. This would be feasible for use in clinical practice, and enable clinicians and researchers to distinguish between internal and external entrapment when needed (Forkmann, Spangenberg, et al., 2018; Schmidt & Hunter, 1996). To do so, we used data from a clinical sample to develop the abbreviated scale, and then we tested the properties of the new Entrapment Scale–Short Form (E-SF) on a large population-based sample of young adults.

Methods

Clinical sample

To develop the short-form scale we used data from a study of adults who presented at the emergency departments of two Scottish general hospitals (in NHS Lothian and NHS Forth Valley) with an episode of self-harm (ICD codes X60–X84, intentional self-harm) in the period between February 2013 and April 2015 (Cleare et al., unpublished). Liaison Psychiatry staff identified potential participants and assessed a patient's medical fitness (i.e. ability to give informed consent) before being approached regarding the study. When patients were deemed to be medically fit, they were asked by the Liaison Psychiatry staff member if they would be interested in finding out more about a research study entitled the role of psychological factors in self-harm. If they agreed to take part, the researcher approached the patient and provided more information about the study, answered any questions before obtaining informed consent. Interviews were conducted either at a patient's bedside or in a private room. Patients were given the option of completing the questionnaires themselves, responding via response cards (with the researcher reading the questions aloud) or via verbal response. Although entrapment is the focus of the present study, participants completed a range of validated psychological measures (see Appendix.

Interviews were carried out by members of the research team (graduate psychologists), who were trained in the administration of the measures and took between 30 and 60 minutes to complete. A total of 1041 potentially eligible patients who had self-harmed were admitted to the two emergency departments over the duration of the study. 500 patients who met the inclusion criteria agreed to take part. Patients were eligible to take part if they were over 18 years of age and had been assessed by a member of the Liaison Psychiatry team at either site and agreed to take part in the study. Exclusion criteria included being unable to provide written informed consent (e.g., being medically unfit or not competent in English), currently involved in another research study conducted in the hospital, or if they were actively psychotic, aggressive or were prisoners. Our sample primarily identified themselves as White (97.2%, n=486) and 60.6% were female (n=303). Around half (53.4% (n=267) were unemployed, and 63.6% were not married (n=318). The mean age was 37 years old (SD=13.8),

and the age range was 18 – 88 years. With regards to previous self-harm, 34% (n= 170) reported that this was their first episode, 41% (n=205) had self-harmed between one and three times previously, and around one quarter (n=125) of the sample reported four or more past episodes. The majority of participants presented to hospital following an overdose (90.6%, n= 453); 27 (5.4%) had self-injured and 20 (4%) were attending following a mixed episode (i.e., both overdose and self-cutting). 67% (n=336) reported suicidal intent associated with the self-harm presentation.

Population-based sample

The population-based data used to validate the E-SF were derived from the Scottish Wellbeing Study (O'Connor et al., 2018), which is a nationally representative population-based study of emotional wellbeing (including suicidal ideation and behaviour) in young adults (18-34 year olds) recruited from across Scotland. 3508 participants completed a battery of psychological measures which taps constructs known to be associated with suicidal ideation and behaviour (e.g., entrapment and burdensomeness). See Wetherall et al. (2018) and O'Connor et al. (2018) for more details. Almost 51% (50.6%) of the sample was male, the overwhelming majority was White (93.8%) and not married (83%). 37.0% of the sample was 18–23 years, with 35.9% and 27.1% aged 24–29 and 30–34 years, respectively. 11.3% and 16.2% of the young people reported a lifetime history of suicide attempts and non-suicidal self-harm, respectively (O'Connor et al., 2018). In addition, more than 20% reported lifetime suicidal thoughts and 16% reported thoughts of non-suicidal self-harm at some stage in their lives.

Entrapment Scale (Gilbert & Allan, 1998)

In both samples, the 16-item Entrapment Scale was administered to assess entrapment. This scale was initially developed to assess feelings of entrapment within the context of depression (Gilbert & Allan, 1998). Respondents are asked to indicate on a 5 point scale (0= "not at all like me", 1= "a bit like me", 2= "moderately like me", 3= "quite a bit like me", 4= "extremely like me"), how much each statement applies to the respondent. The first 10 items are related to external entrapment, such as "I am in a

situation I feel trapped in*"*. The last 6 items refer to internal entrapment (example: "I want to get away from myself"). Total score can range from 0 to 70.

Selection of items for the E-SF

We expect the one factor model to yield the best fit (Forkmann et al., 2018; Griffiths et al., 2015). Additionally, as found in other studies, we expect the factor loadings of most items to be highly comparable and acceptable (between 0.7 and 0.8). Therefore, candidate items for the E-SF cannot only be selected based on small differences between factor loadings or item discriminatory parameters. As other studies point to the importance of distinguishing between internal and external entrapment, two items that have the best statistics from the external entrapment items (first 10 items of the scale) and two items from internal entrapment items (the last six items of the scale) will be selected. Given the anticipated similarity in item-factor loadings, the item selection will also be informed by clinical and theoretical insight. Such an approach will maximize the utility for clinicians and researchers who will be able to distinguish between internal and external entrapment, when needed.

Statistical approach

Factor analysis

In the first step, a principal component analysis (PCA) was used. PCA is a straightforward analysis that is used to determine those items which accounted for most variance in the 16-item scale score (Edelen et al., 2007). The higher the factor loading of an item, the more important the item is in relation to the summed score. We used the principal function of the psych package (Revelle, 2015) to estimate an eigen value decomposition on the correlation matrix of the 16 items.

Confirmatory factor analysis using a a diagonally weighted least squares algorithm was used to verify the factor structure of the 16 items (Rosseel, 2012).

Item response theory

Item response theory (IRT) offers detailed information at the *item* level, making it a powerful technique for the development of short-form scales (Edelen et al., 2007). The responses of participants on each item are used to estimate their location on a latent trait (i.e. level of entrapment). This latent trait is estimated using the responses on all individual items, and not, as in CTT via the sum score of all items. The basic premise of IRT is that the probability of a respondent scoring higher on an item can be modelled as a function of the underlying latent trait (Embretson & Reise, 2000). As an example, in Figure 1, we present the so-called item response curves for item 16*: "*I am stuck in a deep hole I can't get out of*"*. As the entrapment scale has five ordered response options (0 = "not at all like me", 1 = "a bit like me", 2 = "moderately like me", 3 = "quite a bit like me", 4 = "extremely like me"), we used the graded response model to estimate the item response parameters as implemented in the R package ltm (Rizopoulos, 2006; Samejima, 1970). For each response option for item 16, the graph presents the probability of endorsement given the underlying latent trait of a participant. When a respondent has a very low underlying trait of entrapment (i.e. he/she scores on the left side of the x-axis), he/she will be very likely to endorse response 1: "not at all like me*"*. The probability of endorsing item 16 with option one decreases as we move towards the right on the y-axis (i.e., the level of entrapment of a participant is higher). If the overall level of entrapment for a participant is around 0 (the average level of entrapment within the assessed sample), then the probability of endorsing 1 "not at all like me*"* for item 16 becomes zero, and the likelihood of endorsing response 4 ("quite like me*"*) or 5 ("extremely like me*"*) is around 0.4. At each level of entrapment, the summed probabilities of the 5 response options is always 1.

FIGURE ONE ABOUT HERE

Figure 1: Item Response Category Characteristic Curves For Item 16: *"*I am stuck in a deep hole I can't get out of*"*

Within IRT, every single item is defined by a discrimination parameter (alpha) and one or more location parameters or threshold parameters. The threshold parameters indicate the location on the scale of the latent continuum where the item best discriminates among individuals. The discrimination parameter reflects the true difference in theta per item and is comparable to a factor loading. In this example, the alpha = 3.055, and beta1 = -1.555, beta2 = -1.074, beta3 = -0.597 and beta 4 = 0.050 (see also table 2). As found in other studies, the ordering of the size of the alpha's is highly comparable to the ordering of the factor loadings of the PCA (Edelen et al., 2007). The threshold parameters indicate that most information about the item is at the lower end of trait, between -1.555 and 0.050. One can sum the item response curves in Figure 1 to get an overall representation of where on the latent trait the item gives the most information (see Figure 2).

FIGURE 2 ABOUT HERE

Figure 2. Item Information Curve for Item 16: *"*I am stuck in a deep hole I can't get out of*"*. The curve is the result of the summed curves in Figure 1.

As can be seen in Figure 2, item 16 gives most information at the lower end of the average latent trait. Ideally, the different items of a scale offer information across the whole range of the trait. When shortening scales, one wants to select the best combination of items that ensures similar coverage as the full scale (Edelen et al., 2007).

Item selection for the Entrapment Scale Short-Form

To determine the candidate items for the short-form of the scale we selected the items with both the highest factor loadings from the PCA and the highest discriminatory parameter as given by the IRT analyses. Also, we inspected the item information curves to select items that covered a similar range of the latent trait as the full scale did. In any cases of overlap of ranking based on the PCA and the IRT, the final selection of items was determined by the match between the item content and the underlying theory (Gilbert & Allan, 1998).

Cross validation

To control for overfitting the sample, we randomly split the clinical sample dataset into two subsets and compared all statistics across the three samples. This procedure was also adopted for the population-based sample (the Scottish Wellbeing Study).

Correlations between the full Entrapment Scale, the short-form version (E-SF) and other scales

When we selected the items for the short-form scale (E-SF), we compared the correlation between the sum score of items from the short-form with the sum score of items from the full scale. The correlation between the E-SF and the full scale should be high (> 0.8). Also, we compared the correlations between the E-SF, the full scale, and the other scales administered in the study. We expect the correlations between the E-SF and the other scales to be of comparable magnitude/direction as those correlations between the full scale and the other scales.

Validation of the E-SF with data from a different sample

Finally, we tested the properties of the short-form on a different dataset, using data from the Scottish Wellbeing Study (O'Connor et al., 2018). We anticipated that the sum score of the E-SF items would correlate highly with the full scale and that the correlations between the E-SF and the full scale and other scales would be comparable.

Cut-off for the E-SF scale

As we are interested in the relationship between entrapment and suicidal ideation, we used receiver operator characteristic (ROC) curves to determine the best cut-off of the E-SF to classify participants with and without baseline suicide ideation (BSS > 0). The package pRoc was used (Robin et al., 2013).

Selection of items for the E-SF

We expect the one factor model to give the best fit (Forkmann, Teismann, Stenzel, Glaesmer, & De Beurs, 2018; Griffiths et al., 2015). Additionally, as found in other studies, we expect the factor

loadings of most items to be highly comparable and acceptable(between .7 and .8). Therefore, candidate items for the E-SF cannot only be selected based on small differences between factor loadings or item discriminatory parameters. As other studies point to the importance of distinguishing between internal and external entrapment, two items that have the best statistics of the first 10 items will be selected (external entrapment) and two items from the last six items (internal entrapment). As we expect the statistics to be quite similar across items, the research team will make the final decision which items to select based on statistics and clinical and theoretical insight. By doing so we hope to create a short scale with the highest resemblance with the full scale, ánd a scale that enables clinicians and researchers to distinguish between internal and external entrapment when needed.

Results

Descriptive statistics

Within the clinical sample, 497 (99.9%) of the respondents answered all baseline items. For the population-based sample, this was 3457 (99.9%). The clinical sample had a mean (SD) entrapment score of 40.6 (15.6). The distribution of the sum scores for the full Entrapment Scale in the clinical sample was quite different when compared to the distribution within the population-based sample (Figure 3 left and right panel). In the clinical sample, most respondents scored high on entrapment, whereas most people in the population-based sample did not endorse any feelings of entrapment (the median score was 4 and mean (SD) was 10.3 (13.9)).

FIGURE 3 ABOUT HERE

Figure 3: Histogram of sum scores relative to the total sample. Left sample presents the density of scores within the clinical sample. The right sample presents the density of total scores within the population-based sample.

Principal component analysis

Within the clinical sample, principal component analysis showed that 50% of the variance in entrapment was explained by the first factor. A second factor would explain 10% of the variance. Inspection of the scree plot indicated that the acceleration point was after the first factor, although two additional factors also had an eigen value > 1. CFA indicated that both a one factor model and a two factor model fitted the data well (one factor model, CFI = 0.98, TLI = 0.98, RMSA = 0.06 (0.12-0.13, SRMR = 0.09; two factor model CFI = 0.98, TLI = 0.98, RMSA = 0.11 (0.10-0.12, SRMR = 0.08). Similar results were found within the population-based data. In Table 2, the results of the PCA for the clinical sample and the two randomly split samples are presented. As can be seen, many factor loadings scored above 0.7, indicating that many items had a strong relationship with the full scale. For the first 10 items, which comprise the external entrapment subscale, items 4 ("I often have the feeling that I would just like to run away") and 5 ("I feel powerless to change things") had the highest factor loadings. For the last 6 items, which tap the internal entrapment subscale, items 14 ("I feel trapped inside myself") and 16 ("I feel I'm in a deep hole I can't get out of") had the highest factor loadings, although differences with other items were small.

Table 1: Results of the principal component analysis in the clinical sample

Note. Total = total sample (n = 497), split sample 1 = sample split in half (n =249, split sample 2 = sample split in half (n= 248). Bolded items are items with highest scores per subscale (external = 1-10, internal 11-16)

Item response analyses

All assumptions of IRT were met (i.e., the scale is unidimensional, there was no noteworthy local dependence and all items increased monotonously, see Technical Appendix). In Table 3, IRT parameters per item are shown. Consistent with the factor loadings, for the first 10 items (external entrapment), items 4 ("I often have the feeling that I would just like to run away") and 5 ("I feel powerless to change things") had the highest discriminatory coefficients. For the last six (internal entrapment), item 16 scored highest. With regard to the second highest item, items 12 ("I feel

powerless to change things") scored highest within the full sample and one of the random split samples, but item 14 ("I feel trapped inside myself") scored highest within the other the random split sample and within the full sample and random samples of the wellbeing data (see technical-appendix).

TABLE 2 ABOUT HERE

Table 2: Item response parameters within the clinical sample (n=497).

The item information curves (see Figure 4) show that most items provide information on the lower end of the spectrum. Note that as most participants in this particular sample scored high on entrapment the average latent trait of 0 actually relates to a high total score on entrapment. Item 16 ("I feel I am in a deep hole I cannot get out of*"*: the highest grey line in Figure 4) seems to provide the most information, which is also indicated by the highest discriminant coefficient and the highest factor loading in Table 2. Item three is the item that offers most information on the higher part of the trait (Beta4 = 4.50), but as the discriminatory parameter is only 0.57, it does not provide much information overall. This is reflected in Figure 4 y the lower flat green line. In the appendix, the curves for the population-based sample are also presented. They showed a similar pattern, albeit with a mean more to the right, as respondents in the sample scored relative lower on entrapment compared to the clinical sample.

FIGURE 4 ABOUT HERE

Figure 4: Item Information Curves for all 16 items of the Entrapment Scale. Item 1 = black, item 2 = red, item 3 = green, item 4 = blue, item 5 = turquoise, item 6 = pink, item 7 = yellow, item 8 = grey, item 9 = black, item 10 = red, item 11 = green, item 12 = blue, item 13 = turquoise, item 14 = pink, item 15 = yellow, item 16 = grey

Item selection

For the subscale external entrapment, items 4 ("I often have the feeling that I would just like to run away") and 5 ("I feel powerless to change things") had both the highest factor loading and IRT scores. The item with the highest factor loading for the internal entrapment subscale was item 16 *("*I feel I'm in a deep hole I can't get out of"). Item 12 ("I feel powerless to change myself*")* and item 14 ("I feel

trapped inside myself") had very similar scores. After discussing the item content within the research team, we decided that the content of item 14 captures the essence of internal entrapment better than item 12. Cronbach's alpha for the four items (items 4, 5, 14, 16) was 0.87 in the total sample. Cronbach's alphas for the 2 internal (items 4 & 5) and external entrapment items (items 14 & 16) were 0.78 and 0.82, respectively.

Correlations between E-SF, the full Entrapment Scale and other scales

We summed the four selected items and calculated the correlations with the total entrapment scale and all other scales assessed in both the clinical sample and the population-based sample. As Table 3 shows, the E-SF and the full version correlate almost perfectly, both within the clinical sample (0.94) and the population-based sample (0.97). Importantly, the correlations between the E-SF, the full scale and the other relevant scales both at baseline and follow-up are highly comparable. This holds for both the clinical and the population-based samples.

TABLE 3 about here

Table 3: Correlations between E-SF, the Entrapment full Scale and all other scales included in the clinical sample and the population-based sample.

Cut-off

Within the clinical sample, we split the participants into individuals with (84%, n = 420) and without suicidal ideation (16%, n = 80). We found that those with suicidal ideation scored higher on almost all of the scales, including entrapment (no suicide ideation mean (sd) entrapment scale = 24(16) versus suicide ideation mean (sd) entrapment scale = 47 (14), $p < 0.001$). A cut-off of >7 on the E-SF resulted in the best classification of an individual with and without suicide ideation (AUC 0.82 95% CI 0.76-0.87). The best cut-off for the full scale was > 30. Within the population-based sample, 2970 participants (85%) reported no suicide ideation, whereas 538 (15%) reported at least some level of suicide ideation. Except for goal disengagement, participants with suicide ideation scored significantly

worse (i.e., indicative of more distress) on all scales, including entrapment (no suicide ideation mean (sd) entrapment scale = 7(18) versus suicide ideation mean (sd) entrapment scale = 28 (18), $p < 0.001$). A cut-off of > 5 on the E-SF resulted in the best specificity and sensitivity for the population sample (AUC 0.83 95% CI 0.81-0.85). All statistics can be found in the technical appendix.

Discussion

In this study, we used different psychometric techniques to arrive at a reliable and valid short-form of the Entrapment Scale (E-SF). After evaluating the statistics against the background of clinical insight and theory, we decided upon four items for the brief scale: two items tapping internal entrapment ("I feel trapped inside myself", "I feel I'm in a deep hole I can't get out of") and two items tapping external entrapment ("I often have the feeling that I would just like to run away", "I feel powerless to change things"). Our four item scale would be feasible for use in clinical practice, and enable clinicians and researchers to distinguish between internal and external entrapment when needed. Correlations between the sum of these 4 items and the 16-item full Entrapment Scale were nearly perfect (0.94 for the clinical sample and 0.97 for the population-based sample). When comparing the correlations between the E-SF and the full scale with other clinical scales, the correlations were nearly identical. This shows that not only does the E-SF relate to the total Entrapment Scale, but that its relationship with other scales is also highly similar. In sum, the E-SF scale will provide very comparable information about the latent trait of entrapment for each respondent as the full scale currently does. However, its brevity will increase the likelihood that the assessment of entrapment will be implemented in everyday clinical practice. Consistent with recent calls to target entrapment in treatment interventions for suicide risk (O'Connor & Portzky, 2018; Holmes et al., 2018), the ready availability of a brief, easy-to-use scale will facilitate the monitoring of entrapment throughout the treatment process. Using the proposed cut-off of > 7 within a clinical sample, and > 5 within a population-based sample, the E-SF can be used to identify participants who report suicide ideation versus not. In addition to the clinical utility, the proposed E-SF scale will also render the assessment of (internal and external) entrapment in any research study much easier.

According to the statistics, several items were good candidates for a short-form scale to provide maximum information about entrapment. However, as was evident in Figure 4, most items provided information on the same part of the latent trait, making the selection of the optimal subset of items less clear. As a result, we combined these statistical parameters with clinical and theoretical insight, and settled upon items 4, 5, 14, & 16 as the optimal items to yield a robust, reliable, and clinically-relevant short-form scale. To maximize the comparability of clinical assessments and research studies, we strongly urge the use of these four items when assessing patients or research participants. Nonetheless, if clinicians or researchers would rather reduce the burden on patients further, they may choose to assess internal entrapment or external entrapment, thereby reducing overall item load by 87%. Indeed, we found very similar correlations between the full scale and the two internal entrapment items, the two external entrapment items, and using only one item from each subscale.

Limitations

An important limitation was that the statistics did not provide a clear suggestion for the selection of the best items. Indeed the CTT suggested a single factor for entrapment, and many items had factor loadings that were interchangeable. Therefore we relied on theory and recent research insights to develop our short scale. In the original paper on the entrapment scale (Gilbert & Allan, 1998), the authors found both subscales to have satisfactory psychometric properties such that each may be considered a unidimensional measure. In the discussion they state that it probably makes a difference, both theoretically and therapeutically if entrapment is internal or external (Gilbert & Allan, 1998) – for these reasons we thought it important to retain both internal and external entrapment items. Indeed, when developing clinical interventions, we would argue that distinguishing between internal and external motivators for feelings of escape could result in a more tailored intervention for the patient. For example, a patient experiencing a strong need to escape from his/her own thoughts and feelings would benefit from a different treatment therapy compared to a patient experiencing mainly external drivers of entrapment. Consistent with this approach, a recent study that compared motives for a self-harm episode within a sample of hospital treated patients found that patients with mainly internal

motives for the self-harm episode were more at risk when compared to patients with mainly external motives, indicating both groups would benefit from different follow up strategies (de Beurs, Vancayseele, van Borkulo, Portzky, & van Heeringen, 2018). As stated in the introduction, another study which examined the unique contribution of different risk factors for suicide ideation found that both internal and external entrapment are uniquely related to suicide ideation (de Beurs, Fried, et al., 2018). Finally, results from a network analysis study also suggested that internal and external entrapment items form separate clusters (Forkmann et al., 2018).

When comparing individuals with and without suicidal ideation, we found that the group with suicide ideation scored significantly higher on (almost) all scales, including depression and entrapment. Indeed, the entrapment scale was more strongly correlated to depression when compared to suicide ideation (table 3), raising the question about the relationship between entrapment, depression and suicidal ideation. This is not surprising as entrapment emerged from the arrested flight literature as a model of depression. According to this model, feelings of entrapment, i.e., of not being able to escape from one's situation or feelings are theorized as an important predictor of depression (Gilbert & Allan, 1998). However, there is a growing amount of research indicating that entrapment is the key driver of suicidal behavior, more so than depression. For example, a prospective study found that even after controlling for depression, past attempts and other risk factors, entrapment predicted repeat suicidal behavior (O'Connor, Smyth, Ferguson, Ryan, & Williams, 2013). In addition, in a large South Korean adolescent sample, entrapment was also most strongly associated with suicidal ideation, beyond the variance explained by depression (Park et al., 2010). Finally, a recent network analysis showed that both internal entrapment and depressive symptoms uniquely contribute to current suicidal ideation, while also being strongly correlated to each other (D. de Beurs, Fried, et al., 2018).

Although classical test theory and item response theory are important approaches to optimizing psychological scales, an even more efficient way of assessing patients is via computer adaptive testing (CAT; De Beurs, de Vries, de Groot, de Keijser, & Kerkhof, 2014; Magnée, de Beurs, Terluin, & Verhaak, 2017). CAT uses IRT parameters to dynamically select the most informative items for each

individual patient. All patients begin with the same item, but the choice of the second item is based on the individual's response to the first item. This allows different stopping options to be programmed. CAT is extremely flexible, reliable and minimizes the burden on respondents, as they only answer items that provide novel information about their underlying latent trait. However, CAT requires specific software, which is not yet widely available in clinical practice.

More and more, mobile phones are used to collect data multiple times within one person (Hallensleben et al., 2018; Kleiman et al., 2017; Nuij et al., 2017). This has led to a number of important insights, such as that suicide ideation fluctuates heavily over time (Hallensleben et al., 2018; Kleiman et al., 2017). When assessing a psychological construct such as entrapment using mobile technology, one can only administer a limited number of items per construct (Forkmann, Spangenberg, et al., 2018). We would suggest researchers to use the items of our short scale when assessing internal and external entrapment in real-time.

Conclusions

Our findings suggest that the 4-item E-SF will result in comparable results to the 16-item full scale, while reducing administration burden by 75%. As entrapment is an important driver for suicidal behaviour, we hope that the development of the E-SF will lead to more widespread monitoring of entrapment in clinical and research settings.

The Entrapment Short-Form Scale (E-SF)

	Not at all like me	A little bit like me	Moderately like me	Quite a bit like me	Extremely like me
1. I often have the feeling that I would just like to run away.	0	1	2	3	4
2. I feel powerless to change things.	0	1	2	3	4
3. I feel trapped inside myself.	0	1	2	3	4
4. I feel I'm in a deep hole I can't get out of.	0	1	2	3	4

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Ethical standards

Ethical approval was obtained from the relevant ethics committees for both recruitment sites (Site 1; South East of Scotland Research Ethics Committee ref:2012/R/PSY/04. Site 2; East of Scotland Research Ethics Committee ref:12/SS/0195) and the US Department of Defense, Human Research Protections Office.

Conflict of interest

'The authors declare no conflict of interest'.

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