

ORIGINAL RESEARCH

The Cardiff Self-Injury Inventory (English version): Convergent validity and psychometric properties

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Abstract

Background and Aims: The Cardiff Self-Injury Inventory (CSII) is a short (1 min), relatively nonintrusive, measure of previous self-injury behaviors written in English. It measures self-injury with suicidal intent and without such intent, covers actions versus thoughts, and has two time periods (lifetime vs recent [defined as the last 3 months]). The study aimed to examine its psychometric properties and its relationship to more well-established measures.

Methods: A UK community sample of 184 participants completed the CSII and two other measures of self-harming (Deliberate Self-Harm Inventory [DSHI] and Suicidal Behaviors Questionnaire-Revised [SBQ-R]) in March 2020–May 2020. Fifty participants also repeated these measurements 1–2 weeks later.

Results: The CSII showed strong psychometric properties with internal reliability of 0.87 and a test-retest of 0.82. The subscales also showed strong psychometric properties. The CSII showed strong concurrent validity to the other measures of self-injury (SBQ-R, $r = 0.70$; DSHI, $r = 0.81$). A factor analysis supported the idea that there are two distinct components to the overall CSII score arising due to the distinction between suicidal and nonsuicidal behaviors.

Conclusion: The CSII has good psychometric properties in this population and can be used as a fast, nonintrusive, measure of different self-injurious behaviors for clinical or research purposes.

KEYWORDS

deliberate self-harm, nonsuicidal self-injury (NSSI), suicide

1 | INTRODUCTION

Suicide is a serious and growing public health problem and is a leading cause of death. Rates of suicide appear to be increasing (ONS, 2020) with an increase of around 30% in the United States between 2000 and 2018.¹ Evidence also shows that completed suicides are only the tip of the iceberg of self-injury. For instance, in the USA in 2020 there

were approximately 46,000 deaths due to suicide, but around 1.2 million attempted suicides, with 12.2 million seriously thinking about suicide.² Suicide rates have also been predicted to rise due to the global COVID-19 pandemic and its associated negative consequences continue.³ Suicide correlates strongly with hospital-treated self-harm,⁴ and evidence suggests those whose self-harm requires hospital treatment may be at much greater risk of subsequent

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suicide.⁵ More severe injuries are potentially more likely to be fatal, which could explain why self-harm severe enough to be treated in hospital is a risk factor for suicide.

Research into self-injurious behaviors requires a means of being able to quantify these behaviors. There are many instruments available for measuring the frequency, severity, motivations, and types of self-injury and suicide, often in detail. For instance, Sansone and Sansone⁶ examine 10 previous instruments as a prelude to introducing their own instrument (the Self-Harm Inventory). This has led to many healthcare professionals expressing concerns that asking people about self-injury may have detrimental effects.^{7,8} In one study of Human Research Ethics Committee members, most believed that asking vulnerable participants about suicide could cause distress and exacerbate suicidal ideation.⁹ However, empirical research into this question is not supportive of the idea that reporting on these self-injurious behaviors heightens suicidality.^{7,10} In fact, Dazzi and colleagues concluded that acknowledging and openly discussing the topic could lead to less stigma surrounding suicide, therefore encouraging individuals to seek mental health support.¹¹

However, further concerns have been raised about conducting research into self-injury amid a global pandemic. Recommendations have been made to terminate studies that cause too many participants too much distress.¹² As the effects of the pandemic are likely to be felt for many years, it therefore may be advisable to use measures that minimize any possible distress to respondents, whilst still allowing them to be open about their experiences.

In many studies, and in many clinical settings, there is also pressure to gather the needed information in a timely manner as information about self-injurious behaviors are only a part of the study or evaluation of the participant.¹³ Hence, there is a need for measures that are brief and yet also manage to cover important distinctions such as nonsuicidal self-injury (NSSI) versus suicide attempts.

1.2 | Cardiff Self-Injury Inventory (CSII)

The CSII has been developed as a measure of self-injurious behaviors with the specific aims of being as unintrusive as possible and being brief. The CSII only asks about the frequency of certain behaviors,¹ and does not ask about the details, such what precipitated the behavior, the methods used, and so forth. By avoiding questions regarding motivations and details of the act itself, it is hoped that the risk of causing any distress to respondents is minimized.¹² At eight multiple-choice items, it is concise, and takes respondents around 1 min to complete. This is beneficial as research suggests that short questionnaires with simple response formats increase the rates of response and completion.¹³

The CSII is structured to look at the frequency of self-injurious behaviors along three dimensions: intent (NSSI vs. suicide intent); ideation versus actions; and time (lifetime vs. recent).

1.3 | Intent

Self-injurious behaviors have often been dichotomized by whether the person committing the act wanted to die or did not want to die. Acts without intent to die are termed NSSI and those with an intent are termed suicidal self-injury (SSI). While there is debate about the usefulness of this distinction,¹⁴ it remains a popular distinction in both research studies¹⁵ and in clinical assessment of self-injurious behaviors.¹⁶ The CSII therefore contains questions about both types of behaviors.

1.4 | Ideation versus actions

While there is a strong link between thoughts about self-injury and actual self-injury, there may also be some important differences, and the path from ideation to behavior is an important area for both research and clinical consideration.^{17,18} Hence, the CSII attempts to quantify both ideation and actions.

1.5 | Time period

We decided that it would be useful measure self-injury over two periods—lifetime and recent. The first set of questions therefore asks about the behaviors over the whole lifetime of the person which may often be needed for a clinical review/assessment of the person. The second set of questions ask about “recent” episodes. The definition of “recent” was arbitrary and involves a trade-off between being as recent as possible, while having enough actual instances on which to base an analysis. We chose a period of 3 months and therefore the data presented here are valid for this time only. However, other researchers or clinicians may deem other time periods more appropriate for their purposes.

The CSII therefore has eight questions that cover each of these domains (e.g., Question 4 asks about *thoughts of suicide intent over the lifetime*). As such the questions are highly similar but aim to probe these differences. Hence, the aim was to be able to use the CSII either as an overall measure of self-injurious behaviors, or to be broken down as needed by the researcher/clinician into more specific domains (e.g., SSI vs. NSSI) including all eight subscales that are represented only by a single question each.

The CSII has been used in research where all questions have reliably correlated with measures of explicit and implicit hopelessness,¹⁹ which in turn has been implicated in suicidal behaviors.²⁰ Therefore, the CSII may have clinical utility as a tool to quantify self-injurious behaviors, which could aid in risk assessment for suicide, but it needs to be validated first.

A review of measures of self-injury by Borschmanne et al.²¹ emphasized the importance of empirical validation. They excluded 14 instruments from analysis, as they did not have their psychometric properties published, leaving only 7 validated measures. This suggests a gap in the literature for empirically validated measures of self-injury.

Construct validity of the CSII was assessed via its relationship to two well-established measures of self-injury: one that focusses on NSSI and one that focusses on SSI. The Deliberate Self-Harm Inventory (DSHI²²) measures deliberate self-harm without suicide intent (or NSSI as defined in the present paper). It has good internal consistency (e.g., $\alpha = 0.81$ ²²). The instrument has been translated into several languages and has been widely used in research across the world (e.g.,^{23,24}). The Suicidal Behaviors Questionnaire—Revised (SBQ-R²⁵) asks four questions related to suicide (SSI). There is “strong evidence” of its validity²⁶ and reliability (e.g., $\alpha = 0.88$ ²⁵). The scale has been widely used and translated into several languages.

Although the constructs of SSI and NSSI are very closely linked (e.g.,⁴), it is possible to demonstrate a level of discriminant validity if the questions about suicide are more closely associated with each other than to questions about self-harm, and vice versa. Additionally, before the CSII can be used clinically, it needs to demonstrate good reliability. The present study tested the internal reliability of the whole scale (and the subscales) and looked at test-retest reliability by re-testing a number of participants weeks later.

2 | METHODS

2.1 | Participants

Participants were undergraduate students from Cardiff University School of Psychology who volunteered for the study in return for course credits. Ethical permission for the study was given by the Ethics Committee of the School of Psychology, Cardiff University (EC.21.03.09.6305R). The nature of the study was stated in the advertisement on EMS, and students were discouraged from signing up if they felt they would become distressed. Power analysis indicated that for a one-tailed α of 0.05, β of 0.20 and a medium effect size ($r = 0.30$), at least 68 participants would be needed.²⁷

A total of 184 people (137 females, 37 males, 10 nonbinary/not listed) completed the questionnaires at least once, age range 18–29 (mean = 19.9, SD = 1.8). Fifty people then were retested using an anonymity code to match their responses to the first completion (42 females, 6 males, 2 nonbinary), age range 18–24 (mean = 19.6, SD = 1.2).

2.2 | Materials

2.2.1 | CSII

The CSII is split into two sections of four questions each. The first section pertains to behaviors across the whole life, and the second to behaviors in the past 3 months only. Both sections contain the same set of four questions. Respondents are asked how many times they have injured themselves, and how many times they have thought about injuring themselves *without* the intention to die, then the questions are repeated but for thoughts and actions taken *with* the intention to die. Response options for each question are: “none,” “once,” “two or three,” “four to ten,”

and “more than ten.” They are scored as 0, 1, 2, 3, and 4 respectively, with a maximum overall score of 32. See Appendix 1.

2.2.2 | DSHI

The DSHI²² is a seventeen-item questionnaire regarding different types of self-harming behavior without the intention to die. Seventeen common types of self-harm are described, in the format: “Have you ever intentionally (i.e., on purpose) _____ without intending to kill yourself?” Respondents answer either yes or no. The types of self-harm described include cutting, burning, carving words or pictures into one's skin, scratching, biting, rubbing abrasive materials or chemicals into one's skin, inserting sharp objects into one's skin, breaking bones, banging one's head, punching, and preventing wounds from healing. The last question asks respondents to describe any other type of self-harm not included in the questionnaire.

For any item respondents answer “yes” to, the original form of the DSHI asks how old they were when they first started, how many times they have done it, when was the last time they did it, how many years this behavior lasted and whether any injuries were severe enough to warrant medical attention or hospitalization. To minimize distress, we omitted these additional questions except for “How many times have you done this?” as this was the only question directly relevant to the CSII. To score the DSHI in our study, we simply counted the number of behaviors endorsed by each participant. The maximum score obtainable is 17.

2.2.3 | SBQ-R

The SBQ-R²⁵ is a four-item questionnaire assessing suicidal ideation. It asks whether respondents have ever thought about committing suicide, how often they have thought about doing so in the past year, whether they have ever told anyone they were going to commit suicide, and how likely it is that they will attempt suicide one day. Each question is scored differently, as the number of response options varies from five to seven, and they are specific to the question. The maximum score obtainable on the SBQ-R is 18.

2.3 | Procedure

Prior to the study, at the request of the Ethics Committee, Student Support and Wellbeing Services at Cardiff University were contacted and made aware of the contents of the study. They provided the resources “Support Available for Students,” “Dealing with Distress,” “My Daily Maintenance Plan,” and “Self Help Resources and Links,” which were distributed to participants.

The study was conducted online using the software Qualtrics. Participants were given an information sheet outlining the nature of the research and containing descriptions of the content of the questionnaires before they completed a staged consent form. Those who did not give consent to participate were automatically redirected

away from the study website. Participants were directed to answer the questionnaires honestly and as fully as possible, but they could skip questions they did not wish to answer.

Participants completed the questionnaires in the order SBQ-R, DSHI, CSII. They then provided demographic information and answered two security questions (what day of the month they were born and the name of their first pet) so that their data from parts one and two could be matched while retaining anonymity. Following this, participants were shown a 5 min guided meditation video to restore their mood and alleviate potential distress.

Participants were automatically redirected to a separate survey where they could provide an email address that would allow us to contact them for part two without this information being linked to their questionnaire responses.

Participants were then debriefed. After explaining the aims of the study in detail, we attached the resources from the Student Support and Wellbeing Services and provided links to the Cardiff University Wellbeing and Counseling Service, CALL Mental Health Listening Line, the Samaritans Hotline, and Mind Cardiff.

Between 1 and 2 weeks later, we contacted those participants who had provided an email address, and the procedure was repeated for part two.

2.4 | Data analysis

All statistical analyses were performed using SPSS statistics v27. Where a participant missed more than one question on each of the questionnaires the data for that questionnaire was omitted. It was our intention to prorate the score if one item was missing for a particular questionnaire, but no such instances occurred.

3 | RESULTS

3.1 | Descriptive statistics

The descriptive statistics for the three main measures of self-harm are shown in Table 1. All scales show "very good" levels of reliability (Chronbach's $\alpha > 0.80$ ²⁸) and high levels of skew in the distributions.²⁹ The skew is expected in such research as many participants will not have committed any act (or thought) of self-injury. For illustration, 30.0% of respondents scored 0 on the CSII total (and the Lifetime subscale), 59.4% on the Recent subscale, 31.1% on the Self-harm subscale, and 64.8% on the Suicide subscale.

Table 1 also shows the scores from the CSII split into the two sections referring to lifetime incidents and recent incidents. Both these scores show high levels of internal reliability. The CSII can also be split according to questions related to NSSI and SSI. Here the scale relating to NSSI showed good reliability ($\alpha > 0.80$) while the SSI scale only showed acceptable reliability ($\alpha > 0.70$) which may be accounted for by the increased level of skew for this subscale due to the increased rarity of such actions.

TABLE 1 Descriptive statistics for the three questionnaires

Instrument	Mean	SD	Min	Max	Skew	Reliability
	CSII	6.32	6.91	0	31	1.16
SBQ-R	6.75	3.53	3	15	1.07	0.82
DSHI	4.82	7.11	0	45	2.25	0.80
CSII—lifetime	4.39	4.32	0	16	0.70	0.81
CSII—recent	1.93	3.15	0	15	1.77	0.80
CSII—NSSI	4.91	4.97	0	16	0.77	0.89
CSII—SSI	1.41	2.38	0	15	2.38	0.76

Abbreviations: CSII, Cardiff Self-Injury Inventory; DSHI, Deliberate Self Harm Inventory; NSSI, nonsuicidal self-injury; SBQ-R, Suicidal Behaviors Questionnaire-Revised; SSI, Suicidal Self-Injury.

TABLE 2 Factor loadings for the items of the CSII

Scale item	Loadings	
	Factor 1	Factor 2
1. Self-harm actions lifetime	0.84	
2. Self-harm thoughts lifetime	0.85	
3. Suicide actions lifetime		0.76
4. Suicide thoughts lifetime	0.40	0.50
5. Self-harm actions recent	0.70	
6. Self-harm thoughts recent	0.89	
7. Suicide actions recent		0.56
8. Suicide thoughts recent	0.48	0.41
<i>Eigenvalue</i>	4.37	1.23
<i>Percentage of variance</i>	54.6	15.4

Abbreviation: CSII, Cardiff Self-Injury Inventory.

3.2 | Factor analysis of CSII

The eight questions of the CSII were factor analyzed using principal axis factoring with Direct Oblimin rotation and Kaiser Normalization. Bartlett's test of sphericity, which tests the overall significance of all the correlations within the correlation matrix, was significant ($c^2(28) = 905.0, p < 0.001$), indicating that it was appropriate to use the factor analytic model on this set of data. The Kaiser-Meyer-Olkin measure of sampling adequacy indicated that the strength of the relationships among variables was high (KMO = 0.78).

Two main factors were identified with Eigenvalues greater than one that explained 70.0% of the variance. The rotated pattern matrix is shown in Table 2. Only items with factor loadings > 0.40 are shown. The two factors appear to be related to NSSI (factor 1) and suicide (factor 2), though it is noticeable that the question about suicidal thoughts (both lifetime Q4, and recent Q8) loaded on both factors. Although there is some overlap, overall, this suggests that questions regarding self-harm

without the intent to die (NSSI) are more closely associated with other questions about NSSI than they are to questions about SSI, and questions regarding SSI are more closely associated with each other than they are to questions about NSSI therefore supporting the idea that the scale can be used to obtain separate measures of NSSI and SSI.

3.3 | Test-retest reliability

Spearman's rho was used to calculate the test-retest reliability of the CSII. A significant correlation was found, ($r_{s(48)} = 0.82$, $p < 0.001$, 95% CI [0.66, 0.94]). Scores on individual questions were also all significantly correlated ($r_s > 0.50$, $p < 0.001$) except for question 7. The low test-retest reliability of this item (frequency of recent suicide attempts) is probably due to the low endorsement rate of this item particularly for the short time period.

For comparison, scores on the SBQ-R and DSHI for parts one and two were also examined. The SBQ-R significantly correlated across time points ($r_{s(48)} = 0.89$, $p < 0.001$, 95% CI [0.78, 0.96]), as did the DSHI ($r_{s(48)} = 0.91$, $p < 0.001$, 95% CI [0.82, 0.96]). This indicates that participants' responses were largely consistent across the two parts of the study for all questionnaires, therefore suggesting that the CSII demonstrates a comparable level of test-retest reliability.

3.4 | Relationships to other self-injury measures convergent validity

Scores on the CSII were correlated using Spearman's rho with scores on the SBQ-R, and a significant positive correlation was found between the two, ($r_{s(180)} = 0.70$, $p < 0.001$, 95% CI [0.62, 0.77]). A significant positive correlation was also found between the CSII and the DSHI, ($r_{s(180)} = 0.81$, $p < 0.001$, 95% CI [0.75, 0.85]). This suggests a high level of consistency with existing measures of the frequency of self-injury, therefore supporting our hypotheses that the CSII would show strong concurrent validity.

The CSII can also provide estimates of NSSI and suicide behaviors. The CSII-self-harm scale was more strongly associated to the DSHI than was the CSII-suicide ($r_s = 0.82$ vs. 0.57 ; $z = 6.23$, $p < 0.001$). However, the two scales had approximately equal associations to the SBQ-R ($r_s = 0.66$ vs. 0.62 ; $z = 6.23$, *ns*). Hence, there was some evidence of discriminant validity in the two scales.

4 | DISCUSSION

The results of the study suggest that the CSII is both a valid and reliable instrument for the measurement of self-injurious behaviors. Its reliability was as good as two of the most used current instruments (SBQ-R and DSHI) and it had similar test-retest reliability. Its validity was demonstrated by the high correlation to these previous instruments. The results of the factor analysis support the idea that there are two distinct components to the

overall score arising due to the distinction between NSSI and suicidal behaviors.

The major reason for the development of the CSII was to produce a brief questionnaire that was less intrusive than previous measures, and yet could provide information relating to both NSSI and SSI for both lifetime behaviors and for more recent behaviors. Given that there are already measures that show good validity and reliability (e.g., DSHI, SBQ-R) for self-injury, it is these properties that distinguish it from other measures and therefore might be more appropriate in some research and clinical circumstances where issues of intrusion may want to be minimized, such as in on-line studies.¹² Further, the CSII can give separate measures of NSSI versus SSI and can also be used to look at either lifetime or recent event. It is also possible to use all eight questions as a series of one-item questions to look at each of these domains (intent, ideation vs. action, lifetime vs. recent) where this is deemed appropriate in research¹⁹ or clinically. However, use of each item as an individual measure of these concepts has some limitations such as possible misclassification of the event (see Millner et al.³⁰ for a critique of single-item measures of self-injury) and the individual should consider whether it is possible to use a more comprehensive instrument if time/space/resources allow.

4.1 | Measurement of suicidal behaviors versus risk assessment

The CSII was designed as a measure of past self-injury. It therefore differs in its intent from many other instruments (such as the SBQ-R) where the aim of the instrument is to provide a form of risk assessment in the sense of providing a scale that is predictive of future self-injury. However, it is also clear in many domains that past behavior is one of the best predictors of future behavior, and many instruments that hope to assess the likelihood (and therefore management) of future self-injury require an assessment of past self-injury (in some cases both NSSI and SSI—see e.g.,¹⁶). Hence, the CSII could be used as *part* of an assessment of suicide risk but must not be used in isolation to do this. Good risk assessment requires a complete assessment of the individual and their circumstances, including far more detail about the reasons behind past self-injurious behaviors—the very things that were sacrificed to make the CSII less intrusive, fast, and yet able to provide vital (but not complete) information about past self-injury.

4.2 | Limitations and future directions

The major limitation of the study is that it was performed on a sample of students via an on-line survey. While student populations do show significant levels of self-injurious behaviors, further tests are needed on populations with higher rates of self-injury such as those in special hospitals. It is also notable that the SBQ-R has undergone testing in adult and adolescent clinical and nonclinical samples,²⁵ and demonstrated varying levels of Cronbach's α across these different

populations. Hence, this information is needed for the CSII and would also offer the chance to demonstrate known-group validity. Additionally, the CSII should be validated in populations of different ages. The suicide rate for males tends to peak at age 45–49 and for females at 50–54 (ONS, 2020), whereas the rates of self-harm are markedly higher for teenagers than for older people.³¹

5 | CONCLUSION

To conclude, the CSII is a fast and (relatively) unintrusive measure of self-injurious behaviors. It can provide measures of both self-harm without intent to die (NSSI) or with the intent to die (SSI). It can also be used to get a measure of both ideation and action and can be used to look over the person's lifetime or just recent events. The CSII demonstrates acceptable levels of validity in comparison to specialist measures of both NSSI and SSI. It shows acceptable levels of reliability and stability. There remains the need for it to be empirically validated in wider, more diverse samples, in both clinical and nonclinical samples and settings. However, despite its limitations, the strength of these initial findings is promising, and suggests that the CSII has good research and clinical potential.

AUTHOR CONTRIBUTIONS

Robert J. Snowden: Conceptualization; formal analysis; methodology; writing – original draft. **Olivia Tiley:** Investigation; methodology; writing – review & editing. **Nicola S. Gray:** Conceptualization; methodology; writing – review & editing.

CONFLICT OF INTEREST

R. J. S. is the author of the Cardiff Self-Injury Inventory but does not make any profit from its distribution. The remaining authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

The study was given ethical approval by the Ethics Committee of the School of Psychology, Cardiff University.

TRANSPARENCY DECLARATION

The lead author (Robert J. Snowden) affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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ENDNOTE

¹ Throughout this paper we regard ideation as a type of behavior.

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APPENDIX 1

Cardiff Self-Injury Inventory (CSII)

For the questions below please circle the answer that best fits your behavior.

Past Behavior—please think about your behaviors across your whole life

1. How many times have you actually injured yourself deliberately without the intention to kill yourself?

None Once Two or three Four to Ten More than ten

2. How many times have you thought about injuring yourself deliberately without the intention to kill yourself?

None Once Two or three Four to Ten More than ten

3. How many times have you actually injured yourself deliberately with the intention to kill yourself or not be bothered if it did kill you?

None Once Two or three Four to Ten More than ten

4. How many times have you thought about injuring yourself deliberately with the intention to kill yourself or not be bothered if it did kill you?

None Once Two or three Four to Ten More than ten

Current Behavior—please think about your behaviors in the past 3 MONTHS ONLY

5. How many times have you actually injured yourself deliberately without the intention to kill yourself?

None Once Two or three Four to Ten More than ten

6. How many times have you thought about injuring yourself deliberately without the intention to kill yourself?

None Once Two or three Four to Ten More than ten

7. How many times have you actually injured yourself deliberately with the intention to kill yourself or not be bothered if it did kill you?

None Once Two or three Four to Ten More than ten

8. How many times have you thought about injuring yourself deliberately with the intention to kill yourself or not be bothered if it did kill you?

None Once Two or three Four to Ten More than ten

Many thanks for your answers CSII ©R J Snowden (2014).