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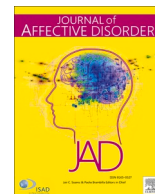
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Review article

Validation of a brief tool to assess and monitor suicidal ideation: The Youth Suicide Ideation Screen (YSIS-3)

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ABSTRACT

Background: . Suicidal ideation is common in young people. Assessment and monitoring can help to understand its dynamic nature and inform treatment planning.

Aims: . The aims were to evaluate psychometric properties of a brief screening tool - the Youth Suicide Ideation Screen-3 item (YSIS-3) and determine its correlation with the Suicidal Ideation Question-Junior (SIQ-JR) and measures of depressive and anxiety symptoms a.

Method: . Cronbach's alpha (α) was used to evaluate internal consistency of the YSIS-3 in 1107 young people. Convergent validity was evaluated using network analysis based on individual item polychoric correlations. Structural equation modelling was used to understand latent constructs; pearson product moment correlations to validate the integrity of the underlying construct. and two-way mixed Intraclass Correlation Coefficient to examine longitudinal stability and Cohen's *d* to assess sensitivity to change.

Results: . The YSIS-3 was found to have internal consistency, convergent validity and criteria validity almost identical to the 15-item SIQ-JR. There was a high correlation (0.91) between the latent factor underpinning YSIS-3 and SIQ-JR. The YSIS-3 was more sensitive to change among those presenting with suicidal ideation at baseline.

Conclusions: . The YSIS-3 is a valid measure for the assessment and monitoring of suicidal ideation, and is sensitive to change. This brief measure can contribute to regular monitoring of the presence and nature of suicidal ideation, which when included in comprehensive assessment, will inform the clinical management of those at risk of suicide.

1. Introduction

Suicidal ideation is common in young people, particularly in those with depression, and is associated with an increased risk of suicide attempt, particularly in the first year after the onset of suicidal ideation (Nock et al., 2008a, 2008b, 2013; Pinto et al., 1997a; Zubrick et al., 2016). Suicidal ideation is a broad construct, and can range from thoughts about death through to planning a suicide attempt, with the

latter more closely associated with subsequent suicide attempts (Nock et al., 2008b). The nature, as well as severity and frequency, of suicidal ideation can fluctuate and can be situation dependent (Clum and Curtin, 1993; Czyz et al., 2019; Hallensleben et al., 2018; Kleiman et al., 2017). However, these fluctuations often go unnoticed by the individual or clinicians, or are not spontaneously disclosed by the young person (Runeson et al., 1996; Wagner et al., 2002). Frequent and regular assessment of suicidal ideation may overcome some of these issues and

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can be an important part of comprehensive assessment and ongoing monitoring.

A range of suicidal ideation measures and tools exist, however, the length of many can be prohibitive, and often they are not freely available (e.g., tools by Beck and Steer, 1993; Reynolds, 1987). Further, many of these tools have been developed for population-based studies for adult cohorts (Batterham et al., 2015) and they are not necessarily beneficial for use with young people in a clinical setting. In an early study, three items were adapted from one of these longer tools, the Beck Scale for Suicidal Ideation (SSI; Beck and Steer, 1993), with a view to developing a shorter tool that could be used frequently to capture suicidal ideation at the time it was being experienced. These three items measured the strength, duration, and level of control over thoughts about making a suicide attempt. The tool has had preliminary validation in 18- to 24-year-olds and correlated with the so-called ‘active’ suicidal ideation factor of the SSI, described as an active desire to make an attempt (Clum and Curtin, 1993). Therefore, the three-item tool potentially represents a more coherent and specific underlying construct. (Clum and Curtin, 1993)

We further refined this brief tool, updating the wording of the items to suit a wider age range (12-25 years) and ensuring that the concepts were clearly defined (e.g., the questions ask about thoughts about ‘killing yourself’ rather than suicide attempt) and more emphasis was placed on frequency, strength and control over those thoughts (Hetrick et al., 2017a). The scale was named the Youth Suicidal Ideation Screen (YSIS-3). Its psychometric properties were tested in a small 12-month naturalistic longitudinal cohort study with 14-25 year old young people (N=101) with depression who were attending a primary, enhanced primary, or tertiary mental health care service. Young people completed the YSIS-3, a measure of depression (Patient Health Questionnaire 9-item scale, PHQ-9; Spitzer et al., 1999), and a measure of suicidal ideation (Suicidal Ideation Questionnaire - Junior, SIQ-JR; Reynolds, 1987) each time they attended their appointment, as well as a questionnaire about the usefulness and acceptability of the YSIS-3 once they had completed the YSIS-3 a minimum number of times. The YSIS-3 correlated well with the SIQ-JR and was found to be useful and acceptable. The YSIS-3 was only moderately correlated with the PHQ-9; this highlighted the importance of using the PHQ-9 to gain extra information about the wellbeing of the young person (Hetrick et al., 2017a).

The overall purpose of the current study was to further validate the psychometric properties of the YSIS-3 in a larger clinical sample. First, we evaluated its internal consistency. Second, we wanted to test its convergent validity (how well two measures capture a common construct (Carlson and Herdman, 2010)) against the longer and well-validated self-report SIQ-JR and its underlying factors and critical items. Third, we wanted to determine how well the YSIS-3 correlated with screening measures for depression and anxiety. Finally, we wanted to see how the YSIS-3 performed over a 3 month period. Based on our earlier work on the YSIS-3 in a small cohort (Hetrick et al., 2017a), we expected to demonstrate strong internal consistency of the YSIS-3 as well as convergent validity of YSIS-3 with the SIQ-JR. We also expected that the YSIS-3 would correlate moderately with measures of depression and anxiety, and would be sensitive to change over 3 months of treatment.

2. Method

2.1. Study design and participants

This study was part of a larger study of young people attending *headspace* centres which had the aim of developing more meaningful outcome measures for young people presenting with mental ill-health (see details of study design described elsewhere; Filia et al., 2020). In brief, the study recruited 1107 young people from five *headspace* centres across Australia (three metropolitan and two regional centres) between September 2016 to April 2018. *headspace* centres are dedicated primary

healthcare services that provide support for young people aged 12-25 presenting for assistance with mental health, social and/or behavioural problems, physical or sexual health concerns, substance use, and vocational support (McGorry et al., 2019; Rickwood et al., 2015). Young people, aged 12-25 years, presenting for their first appointment at *headspace* for mental health or substance use-related issues were eligible to be included in the study.

The study was reviewed and approved by the University of Melbourne Human Research Ethics Committee, and the local Human Ethics and Advisory Group (1646367.9). Written informed consent was obtained from participants aged ≥ 18 years or who were aged 16-17 and were deemed a mature minor by the Access Team. Informed consent was obtained from both participants and a parent/guardian for those aged <18 years or who did not have the capacity to provide informed consent due to mental ill-health.

2.2. Measures

The Youth Suicidal Ideation Screen (YSIS-3) includes three questions assessing the frequency, intensity, and perceived control of active suicidal ideation (killing yourself, making a suicide attempt) over the last week; the timeframe for measurement was informed by a pattern of weekly psychological intervention sessions. Each question is scored on a five-point Likert scale from 0 to 4 with different anchors for each question (see Table 1). A summed total score can be derived (range 0-12), with higher scores indicating more severe ideation.

The self-report SIQ-JR was chosen to validate the construct of YSIS-3, because it is the most commonly used, well-validated, and appropriate outcome measure, as assessed by a systematic review of interventions for the management of suicide risk in young people (Robinson et al., 2011). The SIQ-JR assesses the severity of suicidal ideation over the last month using 15 items. Responses are recorded on a 7-point scale ranging from 0 “I never had this thought” to “Almost every day”. For direct comparisons with the time scale of the YSIS-3, additional questions were asked to determine participants’ responses over the past week. The SIQ-JR was then modified to a 7-point scale ranging from 0 “Not in the past week”, 1 “Monthly” to 6 “Almost every day”, with scores ranging from 0 to 90 and higher scores indicative of more severe ideation. Items 1 and 2 of the SIQ-JR are considered to be ‘critical items’ as they have been shown to be more indicative of increased risk of suicide (Hill et al., 2020a; Pinto et al., 1997b).

The Patient Health Questionnaire 9-item scale (PHQ-9; Kroenke et al., 2001), measuring depression symptoms, and the Generalised Anxiety Disorder 7-item scale (GAD-7; Spitzer et al., 2006), measuring anxiety symptoms, were chosen to evaluate the discriminant validity of YSIS-3. Both PHQ-9 and GAD-7 use a 4-point frequency scale ranging from 0 (“not at all”) to 3 (“nearly every day”) for symptoms in the past 2 weeks. Higher scores depict more severe symptomatology. PHQ-9 total

Table 1
YSIS-3 source questions.

Thinking over the last week:				
How often have you thought about killing yourself? (Frequency)				
<input type="checkbox"/> 0 Not at all	<input type="checkbox"/> 1 Several days	<input type="checkbox"/> 2 More than half the days	<input type="checkbox"/> 3 Nearly every day	<input type="checkbox"/> 4 Every day for most of the time
When you have thought about killing yourself, how strong have those thoughts been? (Intensity)				
<input type="checkbox"/> 0 Not at all strong	<input type="checkbox"/> 1 Somewhat strong	<input type="checkbox"/> 2 Quite strong	<input type="checkbox"/> 3 Very strong	<input type="checkbox"/> 4 Really intensely strong
When you have thought about killing yourself, did you feel like you had the control to stop yourself from making the suicide attempt? (Control)				
<input type="checkbox"/> 0 No doubt I have absolute control	<input type="checkbox"/> 1 A very strong sense of control	<input type="checkbox"/> 2 Quite a strong sense of control	<input type="checkbox"/> 3 Some sense of control	<input type="checkbox"/> 4 No sense of control

score ranges between 0 and 27 and GAD-7 total score ranges between 0 and 21.

Clinical diagnosis, based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013), was obtained from participants' medical records by the research assistants. Through a brief interview with young people, research assistants rated the stage of illness according to McGorry et al.'s (2006) clinical staging model. Earlier stages of disorder (0-1) are indicative of emerging and more mild, undifferentiated symptoms, and later stages (2-4) are more likely to present as discrete, persistent, or recurrent disorders. Individuals at Stage 1a are likely to present with nonspecific depression and anxiety symptoms, with those at Stage 1b showing symptoms likely to reach the threshold for a diagnosis of a specific mental disorder but tend to be less severe, briefer in duration, and not persistent or recurring like those identified as Stage 2 (Iorfino et al., 2019).

2.3. Statistical analysis

All analyses were conducted using R version 3.6.3 (2020-02-29). Simple descriptive statistics were used to characterise the cohort. Distributions of the YSIS-3 scores were compared between gender (as identified by the young person) and across two age groups (12-17 years, adolescence; 18-25, young adulthood). Pearson chi-square (χ^2) tests were used to compare responses across gender and age groups for individual items, and independent samples *t*-tests were employed to explore group differences on the YSIS-3 total score.

Internal consistency of instruments was evaluated using Cronbach's alpha (α) based on polychoric (r_{pc}) correlations (Holgado-Tello et al., 2010) due to each item being measured on an ordinal scale. The convergent validity of YSIS-3 was evaluated by correlating it with the SIQ-JR. We first explored the associations using r_{pc} between the individual items of the SIQ-JR and the YSIS-3. Polychoric correlations were calculated between each pair of items using the *polychor* function from the *polychor* R package. The correlation matrix was displayed using a multidimensional scaling (MDS) network plot (Jones et al., 2018) to visualise clusters of SIQ-JR and YSIS-3 items. MDS was implemented using *mds* function from *smacof* R package, and visualisation was conducted using *qgraph* function from *qgraph* R package. The distance between nodes and the colour of the edge between the node represents the strength of the association (closer distance and the darker edge indicate a stronger association).

The convergent validity of YSIS-3 was evaluated by its correlation with SIQ-JR using Pearson product moment correlations, *r*, of total scores. Structural Equation Modelling (SEM) was also carried out to further evaluate the association between the latent constructs measured by the SIQ-JR and YSIS-3. As individual items were measured on ordinal scales, SEM models were fitted using Weighted Least Squares (WLSMV) estimator using *sem* function *lavaan* R package (Rosseel et al., 2012).

We also investigated the degree of association of the YSIS-3 and SIQ-JR with PHQ-9 and GAD-7. Because the total scores of these measures are based on continuous scales *r* is used to evaluate the strength of these associations. Both YSIS-3 and SIQ-JR were expected to correlate somewhat with depression symptoms on the PHQ-9 and anxiety on the GAD-7.

Longitudinal features of YSIS-3 and SIQ-JR were also compared using data from 625 participants who completed both the baseline and three-month follow-up survey. Intraclass Correlation Coefficient (ICC, the proportion of total variance explained by between-subject variance) was used to evaluate the reliability of instruments (Koo and Li, 2016). In this instance, the ICC cannot be directly interpreted as an index of test-retest reliability; rather, it will also reflect changes in scores due to treatment being received between baseline and three months follow-up. We used ICC, measured using the two-way mixed-effects model (ICC_{3,1}, Koo and Li, 2016), to compare relative longitudinal consistency between SIQ-JR and YSIS-3. Instruments' sensitivity to change after treatment was evaluated using Standardised Response Mean (SRM) (Liang et al.,

1990) and Cohen's *d* effect size (ES). Cohen's *d* was calculated as the change of mean scores divided by the standard deviation of baseline scores, and SRM was calculated as the change of mean scores divided by the standard deviation of score changes, therefore, a larger absolute value of SRM and SE indicates a higher level of sensitivity to change. Commonly, ES of 0.2-0.3 were considered to be small, 0.5 medium, and ≥ 0.8 large treatment effect (Cohen, 1992; Kazis et al., 1989). Separate comparisons were made for those who did and did not report suicidal ideation at baseline, given these may represent different groups. We also wanted to identify whether the instruments were sensitive to change among those who presented with suicidal symptoms.

3. Results

3.1. Participants' characteristics

The participants' characteristics are summarised in Table 2. The cohort contains 1107 young people aged 12 to 25 years ($M=18.1$, $SD=3.3$), predominantly female (62%, $n=961$), born in Australia (89.8% $n=961$), studying and/or working (84.8%). Most of the participants had a diagnosis of anxiety and/or depression (76.7%, $n=801$) and presented in early clinical stages according to the clinical staging model (91.7%, $n=982$, in clinical staging 0-1b), which is indicative of depressive and anxiety symptoms and diagnosed mental disorders that are mild in severity and unlikely to be persistent or recurring (McGorry et al., 2006).

Table 2

Characteristics of the 1107 young people at first presentation to *headspace* for mental health and substance use problems.

	Overall (N=1107)
Age in years	
Mean (SD)	18.1 (3.3)
Age group	
12-14	176 (15.9%)
15-17	324 (29.3%)
18-21	335 (30.3%)
21+	272 (24.6%)
Gender identity	
Female	660 (62.0%)
Male	365 (34.3%)
Other	39 (3.7%)
Missing	43
Country of birth	
Australia	961 (89.8%)
Other	109 (10.2%)
Missing	37
Aboriginal or Torres Strait Islander	
No	881 (95.7%)
Yes	40 (4.3%)
Missing	186
Education and employment status	
Studying only	414 (39.5%)
Working only	170 (16.2%)
Studying and working	306 (29.2%)
Not studying or working	159 (15.2%)
Missing	58
Primary diagnosis	
Depression	186 (17.8%)
Anxiety	271 (25.9%)
Depression and Anxiety	344 (32.9%)
Other	246 (23.5%)
Missing	60
Clinical staging	
0-1a	646 (60.3%)
1b	336 (31.4%)
2-4	89 (8.3%)
Missing	36
Study participation	
Baseline only	442 (39.9%)
Baseline and follow-up	665 (60.1%)

3.2. Level of suicidal ideation in the cohort

Approximately a third (34.7%, $n=370$) of participants reported suicidal ideation over the past week (see Table A1 in Appendix). Frequency, intensity, and control levels of suicidal ideation were comparable between younger (aged 12-17 years) and older participants (18-25 years), whereas female participants had a higher frequency of suicidal ideation (Tables A1 and A2 in Appendix).

The distributions of YSIS-3 and SIQ-JR total scores, as well as their associations, are provided in Fig. 1 (mean [SD]: 1.6 [2.6] for YSIS-3 and 19.8 [20.3] for SIQ-JR). The distributions of total scores were similar, and both positively skewed. The association between the YSIS-3 and SIQ-JR total scores was approximately linear see Fig. 1(A).

3.3. Psychometric properties of YSIS-3

YSIS-3 shows a high level of internal consistency ($\alpha=0.96$), which is comparable with SIQ-JR ($\alpha=0.97$) and slightly higher than PHQ-9 and GAD-7 ($\alpha=0.91$ and $\alpha=0.93$). Associations between individual YSIS-3 and SIQ-JR items are displayed in the network plot in Fig. 2 (correlation coefficients included in Fig. A1 in Appendix). Two clear clusters can be identified in SIQ-JR items. The first cluster includes items 1-4, 11, and 12. These together represent the active desire and intent to kill oneself, henceforth called ‘intent’ (items related to wanting to be dead, thinking it would be better to not be alive, that this would solve problems, and thoughts about how and when to kill oneself). The second cluster represents an interpersonal dynamic indicative of poor connection or a lack of a sense of self or belonging including a wish that one had never been born, henceforth called ‘insignificance’ (items 13, 14, and 15, which are about feeling burdensome or uncared for by others).

The frequency and intensity items (items 1 and 2) from YSIS-3 were more closely related to the ‘intent’ cluster of SIQ-JR. The control item (item 3) from YSIS-3 was closely related to both the ‘intent’ cluster and the ‘insignificance’ cluster of SIQ-JR similarly. Items 5-10 from SIQ-JR were found to be located far away from both YSIS-3 and the rest of the SIQ-JR items on the network

Results from the SEM structure model of YSIS-3 and SIQ-JR are

displayed in Fig. 3. The SEM model estimated a substantially high correlation ($r=0.91$) between the latent factors underpinning YSIS-3 and SIQ-JR. Compared with the YSIS-3 items, the factor loadings of SIQ-JR items were lower and residual variances were higher, which indicates a lower agreement between individual items of SIQ-JR (particularly items 5-10) compared with YSIS-3.

The YSIS-3 total score had a moderate correlation with depressive symptoms ($r=0.56$, $p<0.001$ for PHQ-9) but had a weak correlation with anxiety symptoms ($r=0.37$ for GAD7), which is similar to the correlation between the SIQ-JR and these two instruments ($r=0.62$, $p<0.001$ for PHQ-9 and $r=0.44$, $p<0.001$ for GAD-7), see Table A3 in Appendix). These correlations remain almost the same using the follow-up survey data (results not shown). This suggests that, similar to the SIQ-JR, YSIS-3 shows a slightly higher level of convergence to depression symptoms and divergence to the level of anxiety symptoms

Longitudinal comparisons of YSIS-3 and SIQ-JR from 625 participants with complete information on YSIS-3 and SIQ-JR at both baseline and follow-up are provided in Table 3. Total scores on both measures were scaled between 0 and 1 for easy comparison. The scaled YSIS-3 total scores were slightly lower than SIQ-JR total scores, mostly related to the fact that YSIS-3 does not capture suicidal ideation that has been experienced in the past, whereas SIQ-JR includes a response choice about historical symptoms. Among those who presented with suicidal ideation at baseline, a substantial reduction can be observed at follow-up (scaled total score of -0.17 for YSIS-3 and -0.12 for SIQ-JR). ICC_{3,1}, SE and SRM of the YSIS-3 are slightly smaller than the SIQ-JR, which is expected due to a substantial reduction in the number of items and number of choices in YSIS-3. However, SE and SRM were larger for YSIS-3 when the total sample was stratified by whether the participants reported suicidal ideation at baseline or not (with suicidal ideation at baseline: ES: -0.80 for YSIS-3 and -0.58 for SIQ-JR; SRM: is -0.70 for YSIS-3 vs -0.58 for SIQ-JR; without suicidal ideation: SRM is 0.34 for YSIS-3 vs 0.13 for SIQ-JR; larger absolute values indicate more sensitivity to change). The level of suicidal ideation at baseline between those who participated in the follow-up and those who did not were largely comparable (Median SIQ-J of 12 vs 13 at baseline, results not shown), which indicates that this finding might not be impacted by loss to follow-

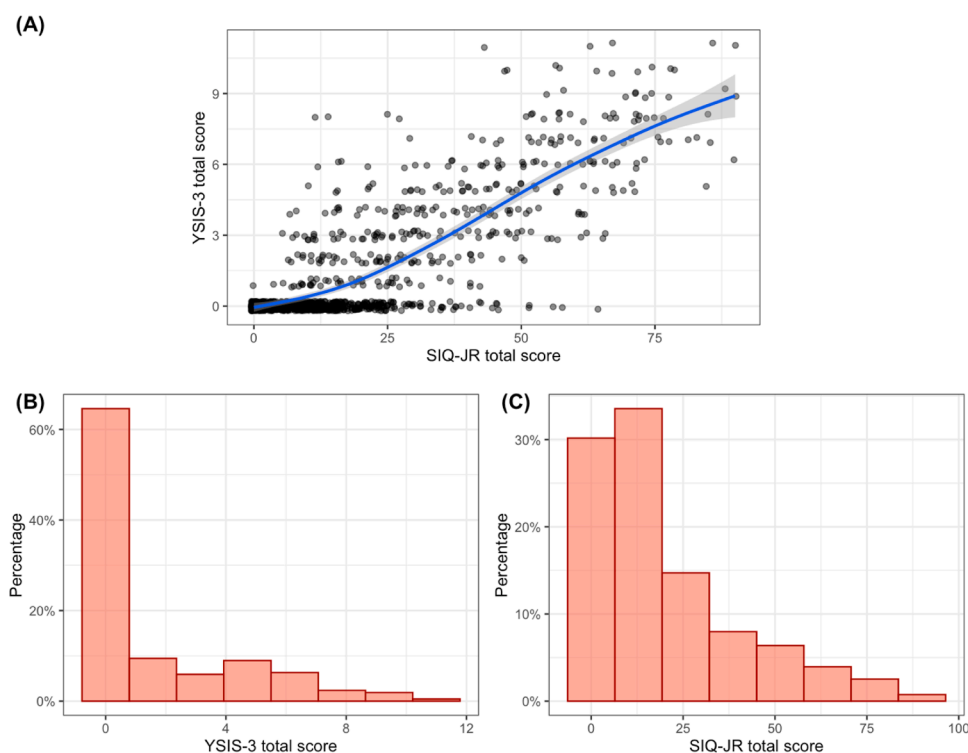


Fig. 1. Distribution of YSIS-3 and SIQ-JR and their association (A) Scatter plot of YSIS-3 and modified SIQ-JR (the superimposed blue line is the loess smooth curve with 95% CI) (B) Histogram of YSIS-3 total score (C) Histogram of modified SIQ-JR total score.

Note: the raw data collection of SIQ-JR involved a typo (“week” instead of “month” in the second response choice), which could be associated with slightly lower value in SIQ-JR.

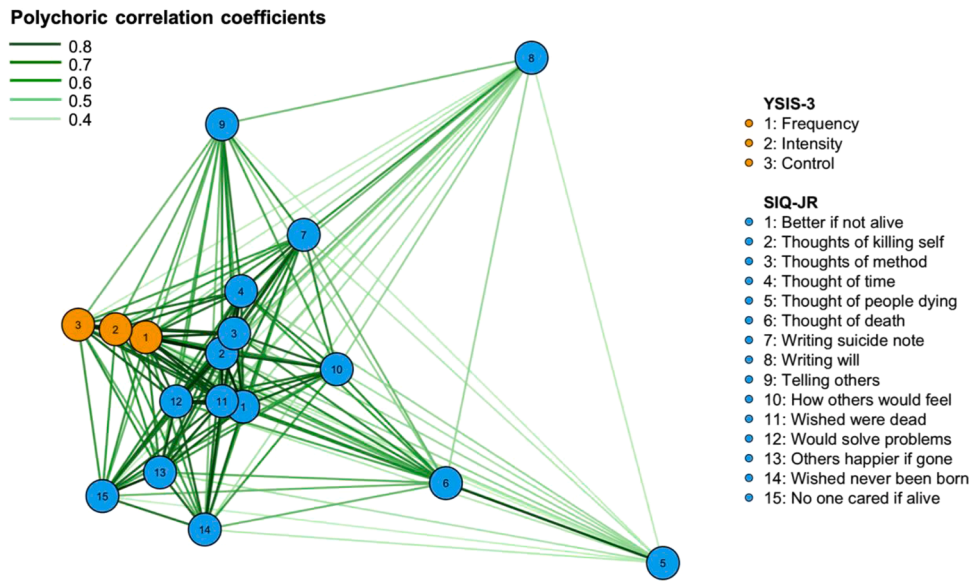


Fig. 2. Network plot of the association between individual items from YSIS-3 and modified SIQ-JR coloured by polychoric correlation coefficients. (based on 1042 records with complete information on two instruments).

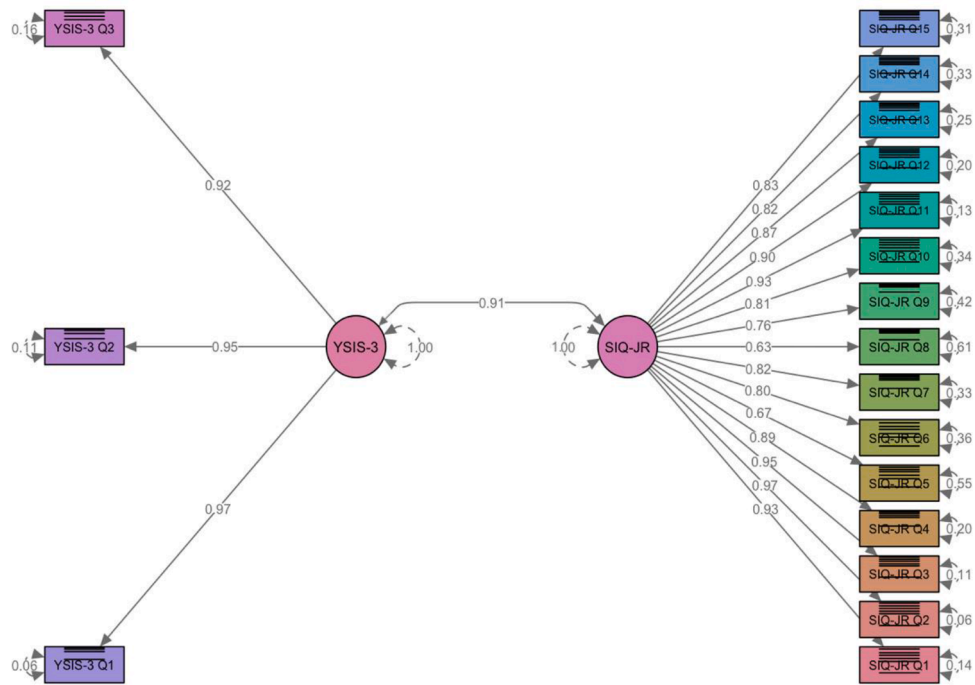


Fig. 3. Latent structure plot of YSIS-3 and modified SIQ-JR (based on 1042 records with complete information on two instruments) Note: single-headed arrows represent factor loading between the latent constructs and measurement items, and double-headed arrow shows the correlation between two latent constructs.

up.

4. Discussion

4.1. Key findings

In a study of a help-seeking population of 12 to 25 years olds, a third of whom experienced suicidal ideation in the past week, we demonstrated the robust psychometric properties of a brief suicidal ideation assessment and monitoring tool, the YSIS-3. This three-item measure demonstrated good convergent validity with the longer 15-item SIQ-JR,

indicating that they are both measuring the same construct. YSIS-3 was also shown to be associated with depressive but not anxiety symptoms. The YSIS-3 was more sensitive to change over three months among those who presented with suicidal ideation at baseline, than the commonly used and psychometrically valid SIQ-JR, as highlighted by higher EM and SRMs. Overall, the YSIS-3 can provide a similar, if not higher level, of useful information about current suicidal ideation compared with the longer SIQ-JR, which has the added barrier of only being available commercially. These findings build on our earlier work demonstrating internal validity and convergent validity of the YSIS-3 with the SIQ-JR (Hetrick et al., 2017a). The YSIS-3 may be a useful

Table 3

Longitudinal evaluation of scaled YSIS-3 and SIQ-JR among 625 participants with complete information on two measurements at both baseline and follow-up.

	All participants N=625		Suicidal ideation at baseline N=218	
	YSIS-3	SIQ-JR	YSIS-3	SIQ-JR
Scaled baseline score*, mean (SD)	0.13 (0.21)	0.22 (0.22)	0.36 (0.21)	0.43 (0.23)
Scaled follow-up score*, mean (SD)	0.09 (0.18)	0.17 (0.20)	0.19 (0.22)	0.30 (0.23)
Changes of scaled score*, mean (SD)	-0.03 (0.19)	-0.04 (0.17)	-0.17 (0.24)	-0.12 (0.21)
Intraclass Correlation Coefficient (ICC _{3,1})	0.50	0.67	0.39	0.57
Cohen's d effect size (ES)	-0.16	-0.19	-0.80	-0.55
Standardized Response Mean (SRM)	-0.18	-0.25	-0.70	-0.58

* YSIS-3 and SIQ-JR total scores were scaled to the range of 0 to 1 for easy comparison.

218 out of 625 participants reported thoughts of killing self in the past week at baseline.

component within clinical assessment and intervention. This is especially the case for time-poor clinicians for whom the length of the SIQ-JR may be another barrier to its applicability and use. In providing a brief and accessible measure, the YSIS-3 can contribute to addressing clinical recommendations that regular monitoring is crucial to the clinical management of suicidal ideation (Rice et al., 2014). The YSIS-3 could usefully be added to a psychosocial assessment to flag the need for further investigation of suicidal ideation and act as a monitoring tool to help clinicians understand the fluctuation in suicidal ideation over time. For routine monitoring and as part of feedback informed treatment, brief measures that are acceptable to both clinicians and consumers are required (Kwan and Rickwood, 2020; Kwan et al., 2021).

As expected and consistent with the setting in which this study took place, primary mental health services, the rate of suicidal ideation in young people was lower than the rates found in clinical samples of young people with moderate to severe mental illness ([e.g., YODA-C randomised controlled trial (Davey et al., 2019)].) but higher than in general population samples (Zubrick et al., 2016). This is a relatively high and concerning rate, particularly given young people in the sample were mostly experiencing early and mild mental health difficulties according to the clinical staging model (stage 0-1b) (McGorry et al., 2006). It is therefore extremely important to regularly monitor for suicide ideation in youth and in primary health services where young people present.

Although, not a primary focus of this study, our results have also highlighted the issues of possible multidimensionality of SIQ-JR, adding to the literature about the underlying factor structure of the SIQ-JR (and its parent questionnaire the SIQ) (Hill et al., 2020b). We have identified two main clusters of items within the SIQ-JR, namely 'intent' to die and 'insignificance' to others. YSIS-3 (particularly items 1 and 2) was found to have stronger links to items in the 'intent' to die cluster; the items in the YSIS-3, particularly items 1 and 2 are consistent with items that have been designated 'critical items' of SIQ-JR (Boege et al., 2014; Hill et al., 2020b; Keane et al., 1996; Pinto et al., 1997a) on the basis that they have been shown to be more indicative of increased risk of suicide (Hill et al., 2020a; Pinto et al., 1997b). A few SIQ-JR items (5-10, related to general thought about death, informing others, and writing a note or will) were also highly separated from the main clusters, which indicates a possible lack of validity of these items for young people.

Given the YSIS-3 does not include static risk factors (e.g., history of suicidal behaviour; inclusion thereof reduces reliability in assessing fluctuations of suicidal ideation), and only includes items indicative of a desire and intent to die, it is then not surprising that: (i) there was some difference in the lower bounds of the scores on the YSIS-3 (0) compared

with the SIQ-JR (1); (ii) it is sensitive to change, particularly among those reporting suicidal ideation at the baseline survey; and (iii) there were no redundant items, indicating that it captures a single construct.

In the context of evidence that indicates a need to specifically target suicidal ideation (Meerwijk et al., 2016; Witte et al., 2021) and an emerging evidence-base for targeted treatment (Alvari et al., 2013; Fitzpatrick et al., 2005; Hetrick et al., 2017b; Robinson et al., 2015; Tighe et al., 2017), it is important to have a brief and reliable measure of suicidal ideation that can indicate the need for further assessment and treatment. Further, as one-off cross-sectional assessment of suicidal ideation is not adequate, a brief, less-intrusive measure that is able to be administered more often allows the fluctuating nature of suicidal ideation to be more easily captured (Clum and Curtin, 1993; Czyz et al., 2019; Hallensleben et al., 2018; Kleiman et al., 2017) and is less burdensome on young people and clinicians. This was the specific aim of Clum and Curtin (1993), who developed and validated the three-item measure that is the basis for the YSIS-3, to allow for regular (daily in their case) self-monitoring to capture fluctuations in suicidal ideation. They demonstrated that this type of self-monitoring does not increase suicidal ideation and can act as a treatment in and of itself via elucidating the factors that are related to changes in suicidal ideation. Our work has built on this; our first study highlighted the YSIS-3 as useful for monitoring and as an effective means of increasing communication about suicidal ideation (Hetrick et al., 2015; Hetrick et al., 2017a). This study provides further validation of the YSIS-3 in a larger sample.

5. Limitations

This study solely relied on self-report questionnaires which could introduce response bias. Follow-up data in this study were collected three months after baseline data collection, hence, it was not possible to accurately measure test-retest reliability due to the natural variations in suicidal thoughts and the response to treatment. Additionally, the evaluation was conducted in a population of young people seeking support from selected primary mental health care settings, with most experiencing clinically significant anxiety and/or depression. Findings may, therefore, not be generalisable to other populations. Further, only about 60% of participants completed the follow-up survey, which reduced our ability to evaluate the longitudinal sensitivity to change for those lost to follow-up. However, the level of suicidality at baseline was comparable between the follow-up and lost to follow-up groups. During the data collection process, there was a typographical error for the SIQ-JR choices ("week" instead of "month" in the second response choice), which could be associated with slightly lower values in SIQ-JR. However, the distribution of individual item choices indicate that the overall response pattern was not impacted by this error and participants were able to identify that it was an error.

6. Conclusions

Assessment of the presence and nature of suicidal ideation is a critical component of a psychosocial assessment. Thorough assessment and regular monitoring is essential to inform good treatment planning. We have demonstrated in a real-world (rather than research) population, the validity and sensitivity to change of a brief measure of suicidal ideation, the YSIS-3. This tool could be used to screen for and monitor suicidal ideation and would be a useful addition to a toolkit of comprehensive mental health symptom measurement tools for assessment and monitoring of young people in research and clinical settings. Future research should investigate the feasibility, acceptability, and clinical utility of implementing the YSIS-3 in everyday clinical practice. Given the critical need to routinely monitor suicidal ideation to detect increases in severity and frequency in order to provide early and appropriate intervention, establishing this brief tool as a valid approach to screening and monitoring youth suicidal ideation is an important development for the field.

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Debra Rickwood is Chief Scientific Advisor to *headspace* and Professor of Psychology at the University of Canberra.

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Instructions for use

The YSIS-3 is a free tool designed to evaluate suicidal thoughts among adolescents and young adults. The YSIS-3 can be used in research and clinical practice, both as a screening tool to indicate need of further assessment and as an outcome monitoring tool to assist clinical treatment and intervention. Any scores of 1+ require further investigation.

Authors' statement

Funding acquisition was led by PM and included team members such as SEH, AGP, DR, SMC. Conceptualization of the study was led by SEH, AGP, DR, and SMC. SEH, AGP, SC supervised data collection. CXG cleaned the data. SMC and CXG developed the analytical plan. CXG conducted the formal analysis under the supervision of SMC. Writing of the original draft was led by SEH, AGP, SMC, and CXG. All authors contributed to writing - review and editing. SMC integrated the feedback into the final version of the paper.

Declaration of Competing Interest

The authors declare no conflict of interest.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.jad.2021.08.053](https://doi.org/10.1016/j.jad.2021.08.053).

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