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Marnin J. Heisel & Gordon L. Flett

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Screening for suicide risk among older adults: assessing preliminary psychometric properties of the Brief Geriatric Suicide Ideation Scale (BGSIS) and the GSIS-Screen

Marnin J. Heisel[a,b,c] and Gordon L. Flett[d]

[a]Departments of Psychiatry and of Epidemiology and Biostatistics, Schulich School of Medicine and Dentistry, The University of Western Ontario, London, Ontario, Canada; [b]Lawson Health Research Institute, London, Ontario, Canada; [c]Department of Psychiatry, Center for the Study and Prevention of Suicide, University of Rochester Medical Center, Rochester, USA; [d]Department of Psychology, York University, Toronto, Ontario, Canada

ABSTRACT

Objectives: To initially assess psychometric properties of two abbreviated versions of the Geriatric Suicide Ideation Scale (GSIS): a 10-item Brief Geriatric Suicide Ideation Scale (BGSIS), and a 5-item Geriatric Suicide Ideation Scale-Screen (GSIS-Screen).

Methods: A series of psychometric analyses was conducted, assessing the internal consistency, test–retest reliability, construct and predictive validity of the abbreviated GSIS scales. This was done by selecting-out GSIS items from a combined dataset of studies on suicide ideation in older adults: 1) The GSIS scale development study ($n = 107$); 2) A clinical trial of Interpersonal Psychotherapy (IPT) modified for suicidal older adults($n = 25$); 3) A longitudinal study of risk and resiliency to suicide ideation in community-residing older adults ($n = 173$).

Results: Overall findings demonstrated strong internal consistency, test–retest reliability, concurrent and predictive validity for the BGSIS and GSIS-Screen with older adults across community, clinical, and residential settings.

Conclusion: Study findings support the use of the abbreviated GSIS scales when conducting research on suicide risk identification among older adults. Future research is recommended testing these scales prospectively in public health, residential, and clinical settings, in research and healthcare delivery contexts.

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Older adults have high rates of suicide, employ lethal means of self-harm, and more frequently succumb to their injuries than do younger adults (Conwell, 2014; Statistics Canada; Wiktorsson, Runeson, Skoog, Östling, & Waern, 2010; WISQARS Database Centers for Disease Control and Prevention [CDC]; World Health Organization, 2014). The pressing need for effective approaches to suicide risk identification and intervention is increasing coincident to the aging of the baby-boomers, a vast birth cohort with a high lifetime suicide rate (Heisel & Duberstein, 2016). A growing body of research supports clinical and community-based interventions in decreasing later-life suicide ideation and behavior (Alexopoulos et al., 2009; De Leo, Dello Buono, & Dwyer, 2002; Gustavson et al., 2016; Heisel, Talbot, King, Tu, & Duberstein, 2015; Kiosses et al., 2018; Oyama et al., 2005, 2008; Unützer et al., 2006), necessitating routine identification of the risk for suicide among older adults (Betz et al., 2016; Canadian Coalition for Seniors' Mental Health, 2006; Erlangsen et al., 2011).

Screening initiatives for later-life suicide risk ideally employ empirically-validated, population-specific assessment tools, consistent with clinical guidelines for psychological assessment and intervention with older adults (American Psychological Association, 2014). Promising findings exist suggesting potential added value in incorporating screens for suicide risk among older adults in primary care and in public health contexts (Almeida et al., 2012; Heisel, Duberstein, Lyness, & Feldman, 2010; Oyama et al., 2005, 2008). However, whereas a majority of older adults visit a primary care or other healthcare provider in days to weeks prior to killing themselves (Ahmedani et al., 2014), effective suicide risk detection and intervention are limited, due in part to a paucity of risk assessment tools that were developed or empirically validated in research with older adults (Betz et al., 2016; Denneson et al., 2010, 2016; Feldman et al., 2007; Husky, Zablith, Alvarez, & Kovess-Masfety, 2016; Vannoy, Tai-Seale, Duberstein, Eaton, & Cook, 2011).

Clinicians in primary care and in mental health services are increasingly assessing suicide risk utilizing single-item measures that were not explicitly designed for use with older adults, such as the 9th item on the Patient Health Questionnaire (PHQ-9), a depression screen designed for use with adults in primary care settings (Kroenke, Spitzer, & Williams, 2001). Although research findings have indicated significant associations between positive responses to the PHQ item #9 and depression (Sirey et al., 2008) and subsequent suicide behavior (Simon et al., 2013), findings are mixed as to the validity of this item with respect to alternate measures of suicide risk (e.g. Na et al., 2018). Walker et al. (2011) reported that two-thirds of patients being treated for cancer who endorsed PHQ item #9 denied suicide ideation in a subsequent research interview, and only one out of the 330 patients interviewed had subsequently attempted suicide. Although Louzon, Bossarte, McCarthy, and Katz (2016) reported that more frequent endorsement

CONTACT Marnin J. Heisel Marnin.Heisel@lhsc.on.ca
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on this item was associated with heightened risk of dying by suicide in a massive sample of Veterans Administration patients ($N = 447{,}245$), nearly three-quarters of those who died by suicide responded 'not at all' to this item in their final PHQ-9 assessment. These results call into question the predictive validity of this screen. This may be due, in part, to the fact that although PHQ item #9 inquires into thoughts of dying and of self-injury ('Thoughts that you would be better off dead, or of hurting yourself in some way'), it does not directly assess thoughts of suicide or history of suicide behavior. These limitations, together with limitations associated with single-item assessment, such as a restriction in range, reliability, and validity metrics, and substantial threat to validity if a participant mishears or misunderstands the item suggest value in utilizing multi-item tools for assessing suicide ideation. Value also exists in assessing considerations associated with suicide risk in older adults, including the wish to die, concerns regarding age-related losses and transitions, and positive psychological variables that potentially protect against suicide thoughts and behavior (Heisel & Flett, 2006).

One of the first suicide risk measures designed for use with older adults, the Geriatric Suicide Ideation Scale (GSIS; Heisel & Flett, 2006) was developed to meet the need for a multidimensional measure of later-life suicide ideation, a variable conceptually (Links, Heisel, & Quastel, 2005) and empirically associated with risk for death by suicide (Britton, Ilgen, Rudd, & Conner, 2012; Brown, Beck, Steer, & Grisham, 2000; De Leo, Draper, Snowdon, & Kõlves, 2013; Smith et al., 2013; Waern, Beskow, Runeson, & Skoog, 1999; Wenzel et al., 2011) and all-cause mortality (Batterham, Calear, Mackinnon, & Christensen, 2013; Shiner, Riblet, Westgate, Young-Xu, & Watts, 2016). The GSIS was developed based on theory, research, and clinical experience with at-risk individuals. It reflected input from mental health experts, and its psychometric properties were tested in heterogeneous samples of older adults (Heisel & Flett, 2006). The GSIS items were designed to be concordant with the phenomenological experiences of older adults who were contemplating suicide, and incorporated items assessing both frank (e.g. 'I have recently been thinking a great deal about specific ways of killing myself') and subtler thoughts of suicide (e.g. 'Sometimes my life feels so hard that I just want to escape'), with the aim of overcoming reporting biases (see Duberstein et al., 1999; Husky et al., 2016). The GSIS is a 31-item measure, with component subscales that assess Suicide Ideation, referring to thoughts, plans, desire, or intent to kill oneself; Death Ideation, reflecting a wish to die although not necessarily at one's own hand; Loss of Personal and Social Worth, reflecting associations between suicide risk and perceived social disconnection, burden, and worthlessness (Fässberg et al., 2012); and a reverse-scored subscale assessing Perceived Meaning in Life. This latter scale reflects theory (Frankl, 1985) and research implicating meaning in life (MIL) in enhancing psychological resiliency and reducing the wish for death or suicide (Breitbart et al., 2015; Edwards & Holden, 2001; Heisel et al., 2020; Heisel & Flett, 2008, 2014, 2016a; Kleiman & Beaver, 2013). The GSIS also contains an item assessing history of suicide behavior, given this variable's strong association with risk for death by suicide (Kim et al., 2012; Suominen et al., 2004).

The GSIS has demonstrated strong internal consistency, test–retest reliability, concurrent, predictive, and discriminant validity in research involving clinical and community samples of older adults, and its items do not appear to be contaminated by socially desirable responding (Barry et al., 2020; Bickford et al., 2019, Bickford, Morin, Nelson, & Mackin, 2020; Cukrowicz, Jahn, Graham, Poindexter, & Williams, 2013; Eades, Segal, & Coolidge, 2019; Jahn, Cukrowicz, Litton, & Prabhu, 2011; Marty, Segal, & Coolidge, 2010; Nadorff, Fiske, Sperry, Petts, & Gregg, 2013; Neufeld & O'Rourke, 2009; O'Rourke et al., 2018; Segal, Marty, Meyer, & Coolidge, 2012). The GSIS has additionally differentiated clinical from non-clinical samples of older adults and between those with or without histories of suicide behavior (Heisel & Flett, 2006). It has also demonstrated sensitivity to clinical change in a trial of Interpersonal Psychotherapy (IPT) adapted for suicidal older adults (Heisel, Duberstein, Talbot, King, & Tu, 2009; Heisel et al., 2015) and in an upstream study designed to assess the effectiveness of Meaning-Centered Men's Groups in enhancing psychological well-being and reducing risk for suicide among middle-aged and older men facing the transition to retirement (Heisel et al., 2020). Although it can be administered in less than 10 minutes, a 31-item assessment tool may be less feasible in busy medical settings and health screenings than in mental healthcare services, and when administered to older adults with difficulty sustaining attention and concentration. Abbreviated versions of the GSIS are thus warranted when seeking to quickly assess suicide ideation in research contexts and in frontline healthcare settings lacking access to mental health providers with specialized training in selecting, administering, scoring, and interpreting psychological assessment tools.

The purpose of the present study was to introduce and assess the psychometric characteristics of the Brief Geriatric Suicide Ideation Scale (BGSIS) and Geriatric Suicide Ideation Scale-Screen (GSIS-Screen), two novel abbreviated versions of the GSIS. These scales were hypothesized to have acceptable internal consistency (Cronbach's $\alpha \geq .65$; see Taber, 2018), significant shorter- (2–4 weeks+) and long term (6–12 months+) test–retest reliability among untreated participants, construct validity as evidenced by significant positive associations with suicide ideation, history of suicide behavior, and other suicide risk factors (depression, social hopelessness, and poor self-rated health) and negative associations with psychological resiliency factors (psychological well-being, life satisfaction, and perceived social support), consistent with a multidimensional theory of suicide ideation in older adults (see Heisel & Flett, 2014, 2016a, 2016b). Measures of internal consistency and of correlations among variables were hypothesized to be of at least medium effect size (i.e. $r \geq .30$; Cohen, 1988). The abbreviated GSIS scales were also predicted to demonstrate discriminant validity by way of low ($r = .10$ to $< .30$) and non-significant associations with social desirability, and moderate to large ($r \geq .30$ to .50) and significant predictive validity with respect to future suicide ideation.

Methods

The psychometric properties of the BGSIS and GSIS-Screen were investigated using data collected in the following

Table 1. Assessment measures administered by study.

Domain	Measure	Study 1	Study 2	Study 3
Suicide ideation	GSIS	X	X	X
	SSI-C	X	X	–
Depression	GDS	X	–	X
	Ham-D	–	X	–
Social hopelessness	SHQ	X	X	X
Psychological well-being	PWB-SF	X	X	X
Subjective well-being	SWLS	X	X	X
Perceived social support	DSSI-PSS	–	X	X
Self-rated health	Health	X	X	X
Cognitive functioning	MMSE	X	X	X
Functional impairment	IADL	–	X	X
	PSMS	–	X	X
Social desirability	MCSF	–	–	X

Note. GSIS = Geriatric Suicide Ideation Scale; SSI-C = Scale for Suicide Ideation-Current; GDS = Geriatric Depression Scale; Ham-D = Hamilton Depression Rating Scale; SHQ = Social Hopelessness Questionnaire; PWB-SF = Multidimensional Psychological Well-Being Scale-Short-Form; SWLS = Satisfaction With Life Scale; DSSI-PSS = Duke Social Support Index-Perceived Social Support Scale; Health = A single self-rated health item scored from 0 to 7; MMSE = Mini-Mental State Examination; IADL = Instrumental Activities of Daily Living Scale; PSMS = Physical Self-Maintenance Scale; MCSF = Marlowe-Crowne Social Desirability Scale-Short-Form. These acronyms will be used throughout the following tables.

three studies of late-life suicide ideation incorporating the GSIS. 1) One hundred and seven participants, 65 years of age or older, were recruited from medical ($n = 25$), mental health ($n = 18$), residential care ($n = 54$), and community settings ($n = 10$) for an initial validation of the GSIS (Heisel & Flett, 2006). Participants were referred by a healthcare provider or residential care home director or volunteered to participate during presentations to seniors' groups or community centers for a study investigating 'successes and difficulties of aging adults.' Participants were administered a cognitive screen and measures of suicide ideation and of negative and positive psychological factors. 2) Twenty-five adults, 60 years of age or older, completed an eligibility assessment for a clinical trial of IPT modified for older adults at-risk for suicide (Heisel et al., 2009, 2015). Potential participants were recruited from older adult medicine and mental health services, and completed eligibility measures of cognitive functioning, functional impairment, pain, medical illness, presence of a mental disorder and of a personality disorder, suicide ideation and behavior, interpersonal problems, and negative life events. Participants had to demonstrate elevated risk for suicide, by virtue of current suicide ideation or death ideation, or self-injurious behavior within the past two years. Individuals with moderate-to-severe cognitive impairment were excluded from the study as were those with a lifetime history of schizophrenia or an active substance misuse disorder whose onset was prior to age 30, as IPT was not designed to treat individuals with these conditions. 3) One hundred and seventy-three community-residing participants, 65 years of age or older, were recruited into a two-year longitudinal study assessing risk and resiliency to the onset or exacerbation of late-life suicide ideation (Heisel & Flett, 2014, 2016a). Potential participants were recruited from seniors' exercise and wellness programs or health fairs, places of worship, shopping malls, coffee shops, and flyers posted in public settings or local newspaper advertisements. Participants were administered measures of cognitive and physical functioning, self-rated health, suicide ideation and behavior, and a set of positive and negative psychological factors.

In addition to the use of common measures (see Table 1), all three studies required written and voluntary informed consent from participants. Participants with severe visual or motor limitations in Study 1 were verbally administered the measures verbatim; all participants in the subsequent studies were administered the measures verbally, given variability in older adults' sensory acuity and comfort responding accurately to reverse-coded measures (Edelstein et al., 2007). Participants could take breaks or schedule additional assessment sessions if feeling fatigued or overwhelmed. The first author, a clinical psychologist, and/or trained research assistants under his supervision, conducted all of the study interviews. All studies incorporated safety protocols, involving referral of participants who appeared to be at elevated risk for suicide to mental healthcare services and/or accompanying them to a hospital emergency department. Participants were additionally provided with a resource sheet listing sources of assistance, consistent with study-specific approved research ethics protocols. The combined study's protocol also received research ethics approval, from The University of Western Ontario's Health Sciences Research Ethics Board.

In seeking to abbreviate the GSIS for the current study, we sought to maintain its psychometric strengths and multidimensional content, by including one or more items that reflected each of the four GSIS subscales, and to reduce the time required for its administration and scoring. An iterative process was used. We evaluated each item's content, clarity, measurement characteristics, and contribution to the overall scale. We initially reviewed each GSIS item and compiled a set of 'critical items' endorsed by at-risk older participants in our clinical and community research on late-life suicide ideation. These included items with strong face validity with respect to suicide ideation (e.g. 'I want to end my life'), history of suicide behavior (e.g. 'I have tried ending my life in the past'), assisted suicide ('I often wish that someone could give me a pill to make me go to sleep and never wake up'), and perceived meaning in life (e.g. 'I feel that my life is meaningful'), and items whose frequency of endorsement could be used to identify extreme responding (e.g. a negative response to the item: 'I feel that my life still has dignity'). Next, we conducted a lengthy series of item analyses, assessing each item's response characteristics overall and on each of the GSIS subscales, including response frequencies, central tendency, variability, initial factor loadings, item-total and item-subscale correlations, and association with clinical factors. We selected items for inclusion that had acceptable characteristics on multiple psychometric criteria. This process thus resulted in a 10-item Brief Geriatric Suicide Ideation Scale (BGSIS) and a 5-item Geriatric Suicide Ideation Scale-Screen (GSIS-Screen), each of which incorporated one or more items from the four subscales of the GSIS. Psychometric analyses of these scales follow.

Measures

Participants completed the Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975), assessing cognitive functioning, and a demographics form assessing age, birthplace, residence, marital status, number of offspring, level of formal education, presence of health problems, and current self-rated health with a single item scored on a 7-point Likert-type scale (1 = Extremely Poor, 4 = Neutral,

and 7 = Extremely Good). They also completed a common set of assessment tools, and additional measures unique to each study's aims (see Table 1).

Suicide ideation

Participants completed the 31-item Geriatric Suicide Ideation Scale (GSIS; Heisel & Flett, 2006) and the interviewer-rated Scale for Suicide Ideation (SSI; Beck, Kovacs, & Weissman, 1979). BGSIS and GSIS-Screen items were selected out from the full GSIS.

GSIS items are scored on a 5-point Likert-type scale, with response options ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The GSIS yields total scores across all 31 items (ranging from 31 to 155), and, as noted above, subscale scores assessing Suicide Ideation (10 items), Death Ideation (5 items), Loss of Personal and Social Worth (7 items), and a reverse-coded subscale assessing Perceived Meaning in Life (8 items). The GSIS has demonstrated strong psychometric properties among clinical, residential, and community-residing older adults (Cukrowicz, Cheavens, Van Orden, Ragain, & Cook, 2011; Heisel & Flett, 2006, 2008, 2016a; 2016b; Jahn et al., 2011, Jahn, Poindexter, Graham, & Cukrowicz, 2012; Jahn & Cukrowicz, 2011; Marty et al., 2010; Nadorff et al., 2013; Neufeld & O'Rourke, 2009; Neufeld, O'Rourke, & Donnelly, 2010;O'Rourke, Heisel, Canham, Sixsmith, & BADAS Study TEAM, 2017, O'Rourke et al., 2018; Segal et al., 2012, Segal, Gottschling, Marty, Meyer, & Coolidge, 2015), including strong internal consistency for GSIS total scores (α = .92–.96) and for its Suicide Ideation (α = .81–.91), Death Ideation (α = .70–.88), Loss of Personal and Social Worth (α = .80–.87), and Perceived Meaning in Life subscales (α = .82–.91), and strong test–retest reliability over shorter (2–4 weeks; ICC = .66–.80) and longer periods (6–24 months; ICC = .53–.79; Heisel & Flett, 2016b). It has additionally shown significant positive associations with depression, hopelessness, loneliness, perceptions of burdening others, dysfunctional coping, personality disorder traits, and poor health ratings (Fiske, Bamonti, Nadorff, Petts, & Sperry, 2013; Heisel & Flett, 2016a; 2016b; Jahn et al., 2011; Marty et al., 2010; Segal et al., 2015), and negative associations with measures of life satisfaction, psychological well-being, perceived social support, reasons for living, meaning in life, and purpose in life (Heisel & Flett, 2016a, 2016b; Heisel, Neufeld, & Flett, 2016; O'Rourke et al., 2018; Segal et al., 2012).

The 10-item BGSIS and the 5-item GSIS-Screen incorporate item content reflecting the four GSIS subscales: Suicide Ideation (e.g. 'I want to end my life'), Death Ideation (e.g. 'I often wish that I would pass away in my sleep'), Loss of Personal and Social Worth (e.g. 'I generally feel pretty worthless'), and Perceived Meaning in Life (e.g. 'I feel that my life is meaningful'). The decision was made to develop abbreviated GSIS scales for use in different contexts. Whereas the BGSIS contains at least two items from each subscale, and was designed to yield brief estimates of each subscale, the GSIS-Screen contains one item per subscale, together with an item assessing past history of suicide behavior ('I have tried ending my life in the past'). Items are scored on a 5-point Likert-type scale, similar to the full-length GSIS. Potential scores thus range from 10 to 50 for the BGSIS and from 5 to 25 for the GSIS-Screen.

The SSI is a 19-item clinician-administered scale designed to assess the presence and severity of death ideation and suicide ideation, presence of a suicide plan, and deterrents, preparation, and anticipation of self-injury. The SSI had an internal consistency of α = .88 in a heterogeneous sample of older adults, and was significantly associated with GSIS scores (Heisel & Flett, 2006). Beck and colleagues reported an inter-rater reliability of .83 for the SSI (Beck et al., 1979), and associations with death by suicide over a roughly two-decade period of follow-up (Brown et al., 2000).

Depression symptom severity

Participants completed the Geriatric Depression Scale (GDS; Yesavage et al., 1982) or the Hamilton Rating Scale for Depression (Ham-D; Hamilton, 1960). The GDS is a 30-item Yes/No scored measure initially developed and validated among community-residing older adults. It has been used in countless studies and has shown strong internal consistency (α = .82–.99), test–retest reliability (r = .85–.94), and construct validity with respect to depression, suicide ideation, and related factors among older adults across diverse settings and cultures (Heisel, Flett, Duberstein, & Lyness, 2005, Heisel et al., 2010; Stiles & McGarrahan, 1998). The Ham-D is a clinician-administered measure of depressive symptom severity for the past week, with strong internal consistency (α = .84) and validity among older adults (Heisel et al., 2009). For the purpose of this study, a 24-item version of the Ham-D was used incorporating prompts and probes to standardize its administration and enhance its validity (see Williams, 1988).

Social hopelessness

Participants completed the Social Hopelessness Questionnaire (SHQ), a 20-item 5-point Likert-scored measure of hopelessness regarding one's relationships, given findings of a salient interpersonal element to hopelessness and suicide ideation and behavior in later life (Duberstein, Conwell, Conner, Eberly, & Caine, 2004a, Duberstein et al., 2004b; Howat & Davidson, 2002; Neufeld & O'Rourke, 2009). The SHQ has demonstrated strong internal consistency (α = .86; Heisel & Flett, 2005) with older adults, and associations with hopelessness, depression, and late-life suicide ideation attest to its validity (Heisel et al., 2006, 2016b).

Psychological well-being

Participants completed Ryff's (1989) Psychological Well-Being scale (PWB), a 6-point Likert-scored multidimensional measure assessing Purpose in Life, Environmental Mastery, Self-Acceptance, Positive Relations with Others, Personal Growth, and Autonomy. A 54-item (9 items per subscale) version of this scale was used in Study 2 and 3; however, as an 18-item (3 items per subscale) version was used in Study 1, we selected out those items for the present study's analyses. The abbreviated scale has acceptable psychometric properties, including internal consistency (α = .66; Heisel & Flett, 2008) and correlations ranging from .70 to .89 with the subscales of the longer form (Ryff & Keyes, 1995). The full PWB measure has demonstrated strong psychometric properties with older adults, including

Table 2. Demographic characteristics of study participants.

Variable	Sample 1 ($n = 107$)		Sample 2 ($n = 25$)		Sample 3 ($n = 173$)		Total ($n = 305$)		
	M	SD	*M*	SD	*M*	SD	*M*	SD	Range
Age	81.5	7.7	71.4	6.7	73.9	6.1	76.3	7.8	60–98
# Children	2.4	1.5	2.9	1.4	2.9	1.3	2.7	1.4	0–9
# Grandchildren	4.4	3.8	4.1	3.3	5.4	3.9	4.9	3.8	0–25
# Great-grandchildren	1.9	4.5	0.5	1.1	3.0	3.1	1.9	4.0	0–32
Health ratings	5.1	1.4	4.2	1.5	5.7	1.1	5.4	1.3	1–7
MMSE	25.6	3.7	28.5	2.0	28.9	1.4	27.7	2.9	15–30
	N	%	*N*	%	*N*	%	*N*	%	
Sex									
Men	26	24.3	13	52.0	51	29.5	90	29.5	
Women	81	75.7	12	48.0	122	70.5	215	70.5	
Setting									
Community	10	9.3	0	0.0	173	100.0	183	60.0	
Retirement	9	8.4	0	0.0	0	0.0	9	3.0	
LTC	45	42.1	0	0.0	0	0.0	45	14.8	
Hospital	25	23.4	0	0.0	0	0.0	25	8.2	
Mental health	18	16.8	25	100.0	0	0.0	43	14.1	
History of suicidal behavior:									
Yes	5	4.7	14	56.0	9	5.2	28	9.2	
No	101	94.4	10	40.0	163	94.2	274	89.8	
Birthplace:									
North America	69	64.5	19	76.0	113	65.3	201	65.9	
South America	0	0.0	0	0.0	1	0.6	1	0.3	
The United Kingdom	15	14.0	1	4.0	35	20.2	51	16.7	
Europe	21	19.6	3	12.0	17	9.8	41	13.4	
Asia	2	1.8	1	4.0	3	1.7	6	1.9	
Africa	0	0.0	0	0.0	4	2.3	4	1.3	
Oceania	0	0.0	1	4.0	0	0.0	1	0.3	
Age Group:									
60–74 years	23	21.9	18	72.0	93	53.8	134	43.9	
75–84 years	43	41.0	7	28.0	72	41.6	122	40.0	
85 years or older	39	37.1	0	0.0	8	4.6	47	15.4	
Marital Status:									
Single	5	4.7	1	4.0	7	4.0	13	4.3	
Married	25	23.4	15	60.0	78	45.1	118	38.7	
Separated/Divorced	15	14.0	6	24.0	33	19.1	54	17.7	
Widowed	62	57.9	3	12.0	48	27.7	113	37.0	
Other	0	0.0	0	0.0	7	4.0	7	2.3	
Education:									
Public School	12	11.2	2	8.3	0	0.0	14	4.6	
Junior High School	12	11.2	1	4.2	6	3.5	19	6.3	
High School	49	45.8	4	16.7	30	17.4	83	27.4	
College/Trade School	15	14.0	8	33.3	46	26.7	69	22.8	
University	13	12.1	4	16.7	54	31.4	71	23.4	
Graduate/ Professional School	6	5.6	5	20.8	36	20.9	47	15.5	

Note. #Children = number of children; #Grandchildren = number of grandchildren; #Great-grandchildren = number of great grandchildren; health ratings = self-reported current health rated on a 1–7 scale (1 = extremely poor; 4 = neutral; 7 = extremely good); MMSE = Mini-Mental State Examination; Community = community location; Retirement = retirement residence; LTC = long-term care facility or nursing home; Hospital = hospital medical or surgical unit; Mental Health = mental health inpatient or outpatient. Sample 1 comprised a heterogeneous sample of older adults recruited for the initial GSIS scale development study from older adult medical and mental health inpatient and outpatient services, nursing and retirement homes, and community locations. Sample 2 comprised a clinical sample of older adults recruited into a trial of Interpersonal Psychotherapy adapted for older adults at-risk for suicide by virtue of current suicide ideation and/or recent history of suicidal behavior. Sample 3 comprised a community sample of older adults recruited into a 2-year prospective longitudinal study investigating psychological risk and resiliency factors potentially associated with the onset and/or exacerbation of suicide ideation.

positive association with life satisfaction and purpose in life and negative association with depression, hopelessness, and suicide ideation (Heisel & Flett, 2016b).

Participants completed the Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985), a 5-item Likert-scored measure of subjective well-being. The SWLS has strong internal consistency ($\alpha = .83$; Heisel & Flett, 2006) and construct validity, including negative associations with later-life suicide ideation (Heisel & Flett, 2016b; Pavot & Diener, 1993).

Perceived social support

Participants completed the 7-item perceived social support subscale of the Duke Social Support Index (DUKE-PSS), a self-report measure of social network size, perceived social support, and instrumental support (Koenig et al., 1993). The DUKE-PSS is internally-consistent ($\alpha = .81$; Purcell et al., 2012) and significantly associated with suicide ideation among older adults (Rowe, Conwell, Schulberg, & Bruce, 2006).

Impairment in physical functioning

Participants completed the Instrumental Activities of Daily Living (IADL) and Physical Self-Maintenance Scales (PSMS; Lawton, 1988; Lawton & Brody, 1969), brief interviewer-rated measures of competence in basic (e.g. toileting, feeding, dressing, and bathing) and instrumental daily activities (e.g. using the telephone, shopping, preparing food, and housekeeping). Higher scores indicate greater functional impairment. These scales have strong psychometric properties with older adults; significant associations have been reported between the IADL and suicide ideation (Heisel & Flett, 2016a; Hirsch et al., 2007).

Table 3. Item-level descriptive statistics and internal consistency for the abbreviated GSIS Scales at the initial assessment.

	BGSIS (α=.905, $n = 296$)							
Item-level responses	*M* (SD)	1	2	3	4	5	Item total *r*	α if item deleted
BGSIS (GSIS) item # and content*								
1 (9) My life is meaningful	1.74 (1.12)	178	69	12	30	9	.739	.891
2 (6) Feel like constant burden to family	1.33 (.74)	229	48	9	7	3	.703	.895
3 (3) Drift off to sleep and never wake up	1.68 (1.00)	170	86	11	23	6	.596	.901
4 (4) I want to end my life	1.68 (1.08)	181	71	11	23	10	.803	.886
5 (22) Have something to live for	1.84 (.83)	104	159	13	17	3	.706	.894
6 (29) Nothing left for me in this world	1.38 (.85)	227	47	6	10	6	.630	.898
7 (19) I generally feel pretty worthless	1.78 (1.03)	153	97	9	33	4	.723	.892
8 (7) I wish I would pass away in my sleep	1.63 (.79)	150	122	10	12	2	.641	.897
9 (11) If things get worse, I will end my life	1.72 (.94)	152	104	15	22	3	.588	.901
10 (27) My life still has dignity	1.58 (.70)	147	137	4	5	3	.541	.903
	GSIS-Screen (α=.823, $n = 298$)							
GSIS-Screen (GSIS) Item # and Content*								
1 (9) My life is meaningful	1.34 (.74)	230	49	9	7	3	.697	.773
2 (19) I generally feel pretty worthless	1.68 (1.08)	182	72	11	23	10	.715	.757
3 (7) I wish I would pass away in my sleep	1.84 (.83)	104	161	13	17	3	.617	.789
4 (4) I want to end my life	1.77 (1.03)	155	97	9	33	4	.672	.771
5 (26) Tried ending life in the past	1.41 (.89)	229	42	3	22	2	.432	.837

Note. *Only brief item stems are presented. GSIS = Geriatric Suicide Ideation Scale; BGSIS = Brief Geriatric Suicide Ideation Scale; *M*=mean; SD = standard deviation; α = Cronbach's alpha coefficient; Item-Total *r*=Corrected item-total correlations. Item-Level Responses were: 1 = Strongly Disagree; 2 = Disagree; 3 = Neither Agree Nor Disagree; 4 = Agree; 5 = Strongly Agree.

Table 4. Internal consistency (α) and test–retest reliability for the abbreviated GSIS scales.

	BGSIS ($n = 296$)			
Scale	# of items	α	Retest #1[a] (ICC)	Retest #2[b] (ICC)
BGSIS-SI	2	.905	.89	.68
BGSIS-DI	2	.880	.89	.70
BGSIS-LOSS	3	.785	.81	.78
BGSIS-MIL	3	.802	.85	.74
BGSIS	10	.905	.91	.80
	GSIS-Screen ($n = 298$)			
Scale	# of items	α	Retest#1[c] (ICC)	Retest#2[d] (ICC)
GSIS-Screen	5	.823	.91	.77

Note. [a]$n = 192$ [b]$n = 139$ [c]$n = 190$ [d]$n = 137$. GSIS=Geriatric Suicide Ideation Scale; BGSIS = Brief Geriatric Suicide Ideation Scale; BGSIS-SI = BGSIS Suicide Ideation Subscale; BGSIS-DI = BGSIS-Death Ideation Subscale; BGSIS-LOSS = BGSIS-Loss of Personal and Social Worth Subscale; BGSIS-MIL = BGSIS-Perceived Meaning in Life Subscale; *M*=Mean; SD = standard deviation; α = Cronbach's alpha coefficient; ICC = intra-class correlation coefficient. Retest #1 took place between 12 and 114 days post-baseline ($M = 35.3$, SD = 21.0). Retest #2 took place between 181 and 683 days postbaseline ($M = 413.1$, SD = 96.0); analyses compare data collected at baseline with that collected at the Time 3 assessment. Intra-class correlation coefficients were computed assuming that the interaction effect was absent. All retest correlations were statistically significant ($p < 0.05$).

Socially desirable responding

Participants completed a 20-item, True–False version of the Marlowe–Crowne Social Desirability Scale (MC-20; Strahan & Gerbasi, 1972) in order to assess the potential impact of impression management on participant responding.

Statistical analyses

Sample characteristics

Demographic characteristics of the combined sample appear in Table 2, and include means, standard deviations, and ranges for continuous variables, and counts and percentages for categorical variables.

Reliability: internal consistency and test–retest reliability

Internal consistency was assessed with Cronbach's coefficient alpha (α) for measures with continuously-scored items; the Kuder–Richardson formula (KR20) was used with dichotomously scored items (see Tables 3–5). Internal consistency statistics for the abbreviated GSIS scales are presented on an item-by-item basis for the BGSIS and GSIS-Screen in Table 3, together with item-level measures of central tendency, variability, item-total correlations, and alpha with each item removed. Measures of internal consistency and test–retest reliability for the full BGSIS and GSIS-Screen were computed for shorter- ($M = 35.3$ days, SD = 21.0) and longer-term periods of follow-up ($M = 413.1$ days, SD = 96.0), employing Cronbach's alpha and intra-class correlation coefficients (ICC), respectively (see Table 4). This was done to assess the overall reliability of the shortened GSIS scales, and to demonstrate that each of their items demonstrated acceptable psychometric properties.

Validity: concurrent and predictive validity

Pearson correlation coefficients were used to assess concurrent validity between the abbreviated and full GSIS and measures of suicide risk and resiliency factors (see Table 5). Descriptive statistics and measures of internal consistency were also computed for the validation measures. Potential between-groups differences were computed for the abbreviated GSIS scales (see Table 6), comparing scores by recruitment setting, participant age category, level of formal education, and lifetime history of suicide behavior at initial assessment. This was done to evaluate the possible impact of group differences on reporting characteristics for these abbreviated scales, to be potentially taken into consideration when interpreting the scales' scores. Omnibus ANOVAs were computed assessing between-group differences; significant *F* tests were followed by computation of Tukey's honestly significant difference test (HSD) to identify the source of these differences. History of suicide behavior was assessed with GSIS item #26 ('I have tried ending my life in the past'); responses of 'Agree' or 'Strongly Agree' were coded as 'Yes' and responses of 'Disagree' or 'Strongly Disagree' as 'No.' Independent-sample *t* tests were computed assessing differences in scores on the abbreviated GSIS scales for participants who endorsed having engaged in suicide behavior as compared with those who did not. Effect sizes (Cohen's *d*)

Table 5. Concurrent validity for the abbreviated GSIS Scales with measures of risk and resiliency factors for the overall sample.

	BGSIS *r* (*p*)	BGSIS-SI *r* (*p*)	BGSIS-DI *r* (*p*)	BGSIS-LOSS *r* (*p*)	BGSIS-MIL *r* (*p*)	GSIS-Screen *r* (*p*)	*M* (SD)	*n*	α
GSISTOT[a]	.93 (.0001)	.72 (.0001)	.82 (.0001)	.78 (.0001)	.76 (.0001)	.92 (.0001)	52.5 (19.6)	296	.96
GSIS-SI[a]	.91 (.0001)	.81 (.0001)	.82 (.0001)	.70 (.0001)	.67 (.0001)	.91 (.0001)	14.8 (6.4)	297	.91
GSIS-DI[a]	.77 (.0001)	.71 (.0001)	.71 (.0001)	.69 (.0001)	.66 (.0001)	.83 (.0001)	8.4 (4.2)	298	.87
GSIS-LOSS[a]	.78 (.0001)	.57 (.0001)	.72 (.0001)	.74 (.0001)	.65 (.0001)	.79 (.0001)	13.9 (6.0)	296	.87
GSIS-MIL[a]	.73 (.0001)	.49 (.0001)	.61 (.0001)	.75 (.0001)	.79 (.0001)	.69 (.0001)	14.1 (4.8)	298	.88
SSI-C	.62 (.0001)	.58 (.0001)	.55 (.0001)	.39 (.0001)	.50 (.0001)	.64 (.0001)	2.1 (5.2)	131	.91[b]
GDS	.68 (.0001)	.36 (.0001)	.59 (.0001)	.66 (.0001)	.46 (.0001)	.66 (.0001)	5.9 (5.6)	260	.89
Ham-D	.74 (.0001)	.71 (.0001)	.70 (.0001)	.66 (.0001)	.58 (.0001)	.73 (.0001)	8.7 (8.7)	152	.90
SHQ	.49 (.0001)	.33 (.0001)	.41 (.0001)	.45 (.0001)	.43 (.001)	.47 (.0001)	49.6 (12.3)	269	.88
PWB-SF	−.68 (.0001)	−.40 (.0001)	−.54 (.0001)	−.65 (.0001)	−.62 (.0001)	−.64 (.0001)	83.7 (10.5)	280	.80
SWLS	−.58 (.0001)	−.40 (.0001)	−.48 (.0001)	−.50 (.0001)	−.52 (.0001)	−.54 (.0001)	25.1 (6.9)	294	.85
DUKE–PSS	−.47 (.0001)	−.37 (.0001)	−.39 (.0001)	−.39 (.0001)	−.49 (.0001)	−.42 (.0001)	19.3 (2.2)	190	.77
Health	−.49 (.0001)	−.35 (.0001)	−.44 (.0001)	−.46 (.0001)	−.38 (.0001)	−.46 (.0001)	5.4 (1.3)	304	–
IADL	.37 (.0001)	.31 (.0001)	.28 (.0001)	.36 (.0001)	.33 (.0001)	.36 (.0001)	1.1 (2.7)	190	–
PSMS	.22 (.002)	.17 (.019)	.14 (.047)	.24 (.001)	.21 (.004)	.19 (.008)	0.2 (0.6)	190	–
MC–SF	−.04 (.575)	−.16 (.045)	−.09 (.275)	.03 (.695)	−.01 (.950)	−.13 (.090)	12.4 (3.6)	164	.73
GSIS-Screen	.87 (.0001)	.71 (.0001)	.77 (.0001)	.66 (.0001)	.62 (.0001)	1.00 (.0001)	–	–	–
M	16.4	2.7	3.4	5.2	5.0	8.0	–	–	–
SD	6.8	1.5	2.1	2.5	2.0	3.5	–	–	–
α	.91	.91	.88	.79	.80	.82	–	–	–

Note. Correlations were computed with pairwise deletion; sample sizes thus varied for each analysis. [a]Correlations with GSIS measures have been corrected by removing overlapping items.
[b]α=.85 for the 5 initial items on the SSI.

Table 6. Between-groups assessment of the abbreviated GSIS scales across demographic and clinical groups.

	Subgroup means (and standard deviations) Recruitment setting							
Measure	Community	Retirement	LTC	Hospital	Mental health	*F*	*df*1/*df*2	*p*
BGSIS	13.4 (3.9)^{ABC}	15.7 (5.7)^{D}	20.2 (6.1)^{AE}	16.8 (4.7)^{BF}	25.5 (8.2)^{CDEF}	53.9	4/291	<.0001
BGSIS-SI	2.2 (0.7)^{C}	2.3 (0.7)^{D}	2.7 (0.9)^{E}	2.6 (0.9)^{F}	4.9 (2.7)^{CDEF}	40.0	4/295	<.0001
BGSIS-DI	2.6 (1.2)^{AC}	3.2 (2.0)^{D}	4.2 (2.4)^{AE}	3.2 (1.3)^{F}	6.2 (2.5)^{CDEF}	40.9	4/295	<.0001
BGSIS-LOSS	4.0 (1.4)^{ABC}	4.8 (1.4)^{DG}	7.4 (2.5)^{AGH}	5.9 (2.2)^{BFH}	7.7 (3.0)^{CDF}	46.7	4/291	<.0001
BGSIS-MIL	4.4 (1.5)^{AC}	5.3 (2.0)	5.9 (1.9)^{A}	5.1 (1.7)^{F}	6.7 (2.6)^{CF}	16.4	4/293	<.0001
GSIS-Screen	6.6 (2.0)^{AC}	7.6 (2.5)^{D}	9.6 (3.4)^{AE}	7.8 (2.2)^{F}	13.0 (4.4)^{CDEF}	53.2	4/293	<.0001
Age								
	60–74 years	75–84 years	85+ years	*F*	*df1*/*df2*	*p*		
BGSIS	15.9 (7.0)^{A}	15.5 (6.3)^{B}	19.5 (6.7)^{AB}	5.6	2/291	.004		
BGSIS-SI	2.9 (1.7)	2.6 (1.5)	2.6 (0.9)	1.9	2/295	.155		
BGSIS-DI	3.4 (2.0)^{A}	3.2 (1.9)^{B}	4.2 (2.6)^{AB}	3.5	2/295	.030		
BGSIS-LOSS	4.7 (2.3)^{A}	5.0 (2.4)^{B}	6.8 (2.6)^{AB}	12.1	2/291	<.0001		
BGSIS-MIL	4.8 (1.9)^{A}	5.0 (1.9)^{B}	5.9 (2.2)^{AB}	5.2	2/293	.006		
GSIS-Screen	8.1 (3.9)	7.6 (3.1)^{B}	9.1 (3.3)^{B}	3.1	2/293	.047		
Formal education								
	PS/JH	HS	College	University	Graduate school	*F*	*df1*/*df2*	*p*
BGSIS	19.4 (6.7)^{AB}	17.0 (6.2)	17.6 (8.1)^{C}	14.4 (5.8)^{AC}	14.6 (5.9)^{B}	4.8	4/289	.001
BGSIS-SI	3.0 (1.6)	2.6 (1.5)	2.9 (1.8)	2.5 (1.2)	2.6 (1.3)	0.8	4/293	.500
BGSIS-DI	4.1 (2.3)	3.4 (2.1)	3.9 (2.5)^{C}	2.9 (1.5)^{C}	3.0 (1.8)	3.3	4/293	.012
BGSIS-LOSS	6.5 (2.7)^{AB}	5.6 (2.5)^{DE}	5.5 (2.9)^{C}	4.3 (1.8)^{ACD}	4.3 (1.9)^{BE}	7.0	4/289	<.0001
BGSIS-MIL	5.8 (1.7)^{AB}	5.3 (2.0)	5.3 (2.3)	4.6 (1.8)^{A}	4.5 (1.6)^{B}	3.5	4/291	.008
GSIS-Screen	9.4 (4.1)^{A}	8.2 (3.2)	8.7 (4.2)	7.2 (3.1)^{A}	7.2 (2.8)	3.4	4/291	.010
Lifetime history of suicide behavior								
	Yes	No	*d*	*t*	*df*	*p*		
BGSIS	22.5 (9.8)	15.7 (6.0)	.84	3.4	25[a]	.003		
BGSIS-SI	4.3 (2.5)	2.6 (1.3)	.85	3.2	24[a]	.003		
BGSIS-DI	5.0 (2.7)	3.2 (1.9)	.77	3.1	25[a]	.004		
BGSIS-LOSS	7.2 (3.5)	4.9 (2.3)	.78	3.1	25[a]	.005		
BGSIS-MIL	6.0 (2.6)	4.9 (1.9)	.48	2.6	293	.009		
GSIS-Screen	13.5 (4.6)	7.5 (2.9)	1.56	6.3	25[a]	<.0001		
GSIS-Screen-SB	9.4 (4.5)	6.3 (2.7)	.84	3.3	25[a]	.003		

Note. [a]A *t* test was used that does not assume equal between-groups variances, given significant Levene's tests for equality of variances. Subgroups sharing the same superscript were significantly different from one another ($p < 0.05$). GSIS = Geriatric Suicide Ideation Scale; BGSIS = Brief Geriatric Suicide Ideation Scale; BGSIS-SI = BGSIS-Suicide Ideation Subscale; BGSIS-DI = BGSIS-Death Ideation Subscale; BGSIS-LOSS = BGSIS-Loss of Personal and Social Worth Subscale; BGSIS-MIL = BGSIS-perceived meaning in life subscale; GSIS-Screen-SB = GSIS-Screen totals excluding the suicide behavior item; PS/JH = Public School or Junior High School education ($n = 33$); HS = Attended or Completed High School ($n = 83$); College = Attended or Completed College ($n = 69$); University = Attended or Completed Undergraduate Studies ($n = 71$); Graduate School = Attended or Completed Graduate School ($n = 47$). Group maximum sample sizes were as follows: Community settings ($n = 181$); Retirement Residences ($n = 9$); Long-Term Care Facilities ($n = 43$); Hospital Inpatient/Outpatient Services ($n = 25$); Mental Health ($n = 42$); 60–74 years of age ($n = 134$); 75–84 years of age ($n = 122$); 85 years of age or older ($n = 47$); endorses suicide behavior ($n = 24$); denies suicide behavior ($n = 271$).

were calculated for these differences, employing pooled standard deviations, using an online effect size calculator (see socscistatistics.com/effect size).

Receiver-operating characteristic (ROC) curve analyses were computed next, investigating cut-scores on the BGSIS and GSIS-Screen for 'High' suicide ideation (GSIS totals ≥ 69, as in Heisel et al., 2005; see Table 7) at the initial study assessment. This was done in order to potentially inform the interpretation of scale scores with respect to clinical risk for suicide behavior. The area under the ROC curve

Table 7. Validity of the abbreviated GSIS Scales for high levels of suicide ideation for all samples.

Measure	Cut score	Sensitivity	Specificity	PPV	NPV	AUC (SE)	95% CI	*p*
BGSIS	19	1.000	.878	.625	1.000	.991(.004)	.983–.999	<.0001
	20	.980	.911	.690	.996			
	21	.920	.943	.767	.983			
	22	**.920**	**.967**	**.852**	**.984**			
	23	.840	.984	.913	.968			
	24	.800	.996	.976	.961			
	25	.660	1.000	1.000	.935			
GSIS-Screen	8	1.000	.724	.424	1.000	.977(.008)	.961–.994	<.0001
	9	.960	.825	.528	.990			
	10	.920	.870	.590	.982			
	11	**.900**	**.947**	**.776**	**.979**			
	12	.800	.980	.889	.960			
	13	.580	1.000	1.000	.921			

Note. GSIS = Geriatric Suicide Ideation Scale; BGSIS = Brief Geriatric Suicide Ideation Scale; PPV = positive predictive value; NPV = negative predictive value; AUC = area under the ROC curve; ROC curve = receiver-operating characteristics curve; SE = standard error; 95% CI = asymptotic 95% confidence interval. Bolded numbers represent suggested cut scores. Suicide ideation was dichotomized as "High" (GSIS-TOT $\geq$ 69) or "Low" (GSIS-TOT $<$ 69).

Table 8. Summary of a multiple linear regression analysis predicting sample 3 Suicide Ideation Scores (SSI-C) at time 2 with the abbreviated and full GSIS ($n = 129$).

	Variable	*B*	*SE B*	β	*t*	*p*	Tolerance	VIF
Step 1	(Intercept)	−.32	.14	–	−2.27	.025	–	–
	GSIS-Screen	.06	.02	.25	2.87	.005	1.00	1.00
Step 2	(Intercept)	−.24	.14	–	−1.64	.104	–	–
	GSIS-Screen	.11	.03	.44	3.56	.001	.46	2.17
	BGSIS	−.05	.02	−.27	−2.16	.033	.46	2.17
Step 3	(Intercept)	−.38	.16	–	−2.42	.017	–	–
	GSIS-Screen	.07	.04	.29	2.04	.044	.34	2.91
	BGSIS	−.08	.03	−.41	−2.93	.004	.36	2.81
	GSIS-TOT	.02	.01	.33	2.12	.036	.29	3.40

Note. R^2=.06, $F_{(1,\ 127)}$=8.22, $p = 0.005$ for step 1; R^2=.09, ΔR^2=.03, F change$_{(1,\ 126)}$=4.64, $p = 0.033$ for step 2; R^2=.13, ΔR^2=.03, F change $_{(1,\ 125)}$=4.49, $p = 0.036$ for step 3. SSI-C = Total Scale for Suicide Ideation scores for the current week; GSIS = Geriatric Suicide Ideation Scale; GSIS-Screen = GSIS-Screen; BGSIS = Brief GSIS; GSIS-TOT = GSIS total scores; VIF = Variance Inflation Factor. For the present analysis, predictors include baseline GSIS-Screen scores (Step 1), baseline BGSIS totals excluding overlapping items with the GSIS-Screen (Step 2), and baseline GSIS totals excluding overlapping items with both the GSIS-Screen and the BGSIS (Step 3).

(AUC) was computed for each measure, together with the specificity, sensitivity, positive- (PPV) and negative-predictive values (NPV) for a range of possible cut scores.

Findings of a multiple linear regression analysis appear in Table 8, investigating the validity of predicting Time 2 SSI scores with sequentially longer versions of the GSIS measures. This was done to investigate the potential added value of incorporating longer, as compared to shorter, assessment tools when assessing suicide risk among older adults. These analyses focused exclusively on participants in Study 3, a non-interventional, longitudinal follow-up study. Baseline GSIS-Screen scores were initially entered on Step 1, BGSIS scores on Step 2, and full GSIS scores on Step 3; the incremental change in variance explained in Time 2 suicide ideation was reported with R^2 change and omnibus F change statistics. Redundancy among the GSIS scales was controlled by entering non-overlapping items on each step of the regression analysis, and tolerance and variance inflation factor (VIF) statistics were computed to assess for multicollinearity. Analyses were computed with SPSS versions 24.0 and 25.0 for Windows, with a Type I error rate set at $\alpha = 0.05$, two-tailed.

Results

Sample characteristics

This study's combined sample comprised 305 individuals, 60 years of age or older ($M = 76.3$ years, SD = 7.8, Range: 60–98; see Table 2). Women accounted for a majority of the participants ($n = 215$ or 70.5%), as is common in voluntary research with older adults. Most participants were either currently married ($n = 118$; 38.7%) or widowed ($n = 113$; 37%). Participants were recruited from community locations ($n = 183$), retirement residences ($n = 9$), nursing or long-term care (LTC) homes ($n = 45$), and from hospital ($n = 25$) and mental healthcare settings ($n = 43$). Participants generally reported being in good health ($M = 5.4/7$, SD = 1.3) and were cognitively intact (MMSE: $M = 27.7/30$, SD = 2.9); a small percentage reported being in relatively poor health (i.e. scored < 4 on the perceived health item: $n = 27$; 8.9%) or evidenced a lower level of cognitive functioning (MMSE ≤ 23: $n = 31$; 10.3%). Forty-four participants (16.9%) scored above 11 on the GDS, and 30 (11.5%) scored above 14, respectively lower or more stringent cut scores for the possible presence of depression (Yesavage et al., 1983); 23 (15%) scored at or above 17 on the Ham-D, suggestive of clinical levels of depressive symptom severity (Zimmerman, Martinez, Young, Chelminski, & Dalrymple, 2013). Twenty-eight participants (9.2%) endorsed having tried to end their life at some time. All of the study measures had acceptable internal consistency ($\alpha \geq .65$; see Table 5).

Reliability: internal consistency and test–retest reliability

Reliability statistics indicated strong internal consistency and test–retest reliability for the abbreviated GSIS scales (see Tables 3 and 4). The combined sample had strong internal consistency for the BGSIS ($\alpha = .91$, $n = 296$) and GSIS-Screen ($\alpha = .82$, $n = 298$). Although the modal response for each item was in the 'Disagree' range, the BGSIS and GSIS-Screen had acceptable skewness (1.55, 1.69) and kurtosis statistics (2.44, 2.89), respectively. Average item-total correlations were strong ($r \geq .60$) for both scales. The only item whose removal would have yielded a slight increase in internal consistency was GSIS-Screen Item #5, assessing self-reported history of suicidal behavior. We retained this item, given the strong association between past suicidal behavior and future lethal and non-lethal self-injury (e.g. Chiu et al., 2004). Test–retest reliability was strong and statistically significant over shorter and longer periods of follow-up (ICC $> .65$; see Table 4) for all GSIS scales and subscales.

Validity: concurrent and predictive validity

The abbreviated GSIS measures demonstrated strong concurrent and predictive validity (see Tables 5–8). The shortened scales were significantly positively associated with GSIS totals and subscales in the combined sample, with correlations ranging from $r = .49$ to .93 ($p \leq .0001$), strong effects according to Cohen's (1988) criteria. Overlapping items were removed from the outcome scales to avoid duplicating item content and artificially inflating correlations. The abbreviated GSIS scales were significantly positively associated with SSI scores ($r = .39$ to .64, $p \leq .0001$), reflecting moderate to strong effects, and supporting their construct validity with respect to a clinical measure of suicide ideation that was not explicitly developed for use with older adults. Construct validity was further evidenced by significant positive associations between BGSIS and GSIS-Screen totals and depressive symptom severity and social hopelessness ($r = .47$ to .74, $p \leq .0001$), and negative associations with psychological well-being, satisfaction with life, and perceived social support ($r = -.42$ to $-.68$, $p \leq .0001$). Moderate to strong significant negative associations with self-rated health ($r = -.46$ to $-.49$, $p \leq .0001$) and small to moderate positive associations with functional limitations ($r = .19$, $p \leq .01$ to .37, $p \leq .0001$) demonstrated a significant impact of health limitations on suicide ideation. Weak and non-significant associations between the GSIS measures and Marlowe–Crowne Social Desirability Scale ($r = -.04$ to $-.14$) suggested discriminant validity from apparent attempts at impression management.

The brief GSIS scales differentiated significantly among participants recruited from community, residential, and healthcare settings, across age groups and levels of formal education, and between those with or without a lifetime history of suicide behavior (see Table 6). Mental health clients scored significantly higher on BGSIS and GSIS-Screen totals than did participants recruited from the other settings; many of these findings held for the BGSIS subscales as well. The oldest-old participants (i.e. 85+ years) generally scored higher on the brief GSIS scales than did the younger participants. An apparent inverse association emerged between level of formal education and scores on the brief GSIS scales. History of suicide behavior was significantly positively associated with all of the abbreviated GSIS scales; individuals who endorsed past suicide behavior scored nearly one standard deviation above those who denied having done so, yielding strong effects for all subscales ($d = .48$–1.56). Given that the GSIS-Screen includes an item assessing history of suicide behavior, we repeated this analysis removing this item (see Table 6). The restricted GSIS-Screen totals still differentiated significantly between groups endorsing or denying a lifetime history of suicide behavior, and produced a strong effect size ($d = .84$). These findings suggest an ongoing impact of past history of suicide behavior on current suicide thoughts and considerations, and one that could be detected with the abbreviated GSIS scales.

The brief GSIS scales differentiated significantly between participants at higher (GSIS ≥ 69; $n = 50$) as compared with lower levels of suicide ideation (GSIS < 69; $n = 246$) in ROC curve analyses. The area under the ROC curve (AUC) was significant for the BGSIS (AUC = .99, SE = .00, $p < .0001$) and the GSIS-Screen (AUC = .98, SE = .01, $p < .0001$; see Table 7). Cut scores of 22 on the BGSIS and 11 on the GSIS-Screen optimized sensitivity (.92 and .90) and specificity (.97 and .95), and yielded relatively high respective positive (PPV; .85 and .78) and negative predictive values (NPV; .98 and .98).

Predictive validity for the brief GSIS scales was evidenced by sequential findings from a linear regression analysis. These findings further showed that increasing the length of the GSIS scales, from the 5-item GSIS-Screen to the 10-item BGSIS to the 31-item GSIS, significantly improved prediction of future SSI scores (see Table 8). Variance inflation factors (VIF) were all less than 10, and tolerance values all greater than 0.25, suggesting that these analyses were not subject to extreme multicollinearity.

Discussion

The purpose of the present study was to introduce and investigate the initial psychometric properties of two new abbreviated versions of the Geriatric Suicide Ideation Scale (GSIS; Heisel & Flett, 2006), a measure with strong psychometric properties in research and clinical practice with older adults (Heisel & Flett, 2016b; Perlman, Neufeld, Martin, Goy, & Hirdes, 2011; United States Substance Abuse & Mental Health Services Administration, 2011). Given a paucity of empirically-supported screens for suicide ideation available for research and clinical practice with older adults, and further given a paucity of psychological assessment expertise extant in many of the settings in which older adults seek care, we sought to abbreviate the GSIS to enhance detection of later-life suicide risk in diverse settings and contexts. Findings overall demonstrated strong psychometric properties for the 10-item Brief Geriatric Suicide Ideation Scale (BGSIS) and the 5-item Geriatric Suicide Ideation Scale-Screen (GSIS-Screen) including internal consistency, shorter- and long-term test–retest reliability, and construct, predictive, and discriminant validity. These new measures are substantially shorter than existing suicide ideation scales, and in keeping with stated arguments for the development and use of brief measures in general (e.g. Burisch, 1984a, 1984b; Gosling, Rentfrow, & Swann, 2003) and when assessing suicide risk and resiliency processes (Ringer et al., 2018; Wadhwa & Heisel, 2020), these measures should have considerable utility for a variety of purposes.

We sought to develop abbreviated versions of the GSIS of sufficient length to yield acceptable psychometric properties, and yet of sufficient brevity so as to support their routine use. Pragmatic limitations associated with single-item measurement with older adults include a negative impact if items are misheard or misunderstood, and challenges associated with use of idiosyncratic language. Given the tendency of older adults to downplay expression of psychological symptoms (Cukrowicz et al., 2013; Duberstein et al., 1999), obvious or bluntly-worded items might invite denial. And yet, items with more indirect (e.g. 'hurting' rather than 'killing' oneself) or subtle language (e.g. 'tired of living') might not capture fully the intensity of severe suicide ideation, and compound or double-barreled items (e.g. 'wish to die or to kill yourself') lack clarity and precision. We thus opted to develop two abbreviated scales, one that enabled investigation of component subscales

relevant to aspects of later-life suicide ideation (BGSIS), and an even briefer tool designed as a more general screen (GSIS-Screen). Importantly, these briefer measures were derived from a longer measure that was tailored to reflect themes relevant to older adults.

Distributions of the GSIS scales' items were largely positively-skewed, reflecting a low prevalence of older adult suicide ideation in most settings. Yet, skewness ratings did not suggest extreme departure from normality, and participants employed the full range of response options. Use of continuous, as compared with dichotomous or categorical, scoring enhances response variability; we opted to retain continuous item-response options to enhance sensitivity across suicide risk levels.

Findings evidenced strong internal consistency for the abbreviated GSIS scales and strong test–retest reliability over shorter and longer periods of follow-up. These findings generally attest to the consistent reporting of relatively low levels of suicide ideation among study participants, as we sought to exclude individuals from the retest analyses who were currently receiving mental health treatment. Taken in conjunction with published findings of sensitivity of the overall GSIS to change in clinical (e.g. Heisel et al., 2009, 2015) and community-level intervention studies (e.g. Heisel et al., 2020), these findings suggest that the abbreviated GSIS scales are consistent, and support their use when monitoring risk and as clinical outcome tools. We feel this addresses a void so that when seeking to assess suicide ideation among older adults, researchers and clinicians need not turn to general suicide ideation measures or to scales designed to screen for depression if brevity is a significant concern.

Construct validity was evidenced by strong and significant positive associations between the brief GSIS scales and the full GSIS, following removal of overlapping items, and with SSI totals. These measures were also strongly associated positively with depressive symptom severity and social hopelessness and negatively with psychological well-being, subjective well-being, and perceived social support. Significant negative associations with general health ratings and small positive associations with functional impairment further attested to the validity of the brief GSIS scales, and supported research findings of associations among physical health problems, death ideation, suicide ideation, and suicide behavior in older adults (Fässberg et al., 2016; Handley et al., 2014; Jang et al., 2014; Jeong et al., 2014; Koponen et al., 2007; Kwon & Kim, 2012; Li & Conwell, 2010; O'Riley et al., 2014; Ponte, Almeida, & Fernandes, 2014; Stickley & Koyanagi, 2016; Stolz, Fux, Mayerl, Rásky, & Freidl, 2016). The brief GSIS scales demonstrated weak non-significant associations with a measure of social desirability, with the exception of a slight, yet significant, association between the BGSIS-Suicide Ideation subscale and the abbreviated Marlowe–Crowne Social Desirability Scale. Overall, these findings attest to the strong construct validity of the brief GSIS scales, and suggest that these scales are not susceptible to apparent attempts at impression management.

The brief GSIS scales differed significantly by group across demographic variables, assessment settings, and history of suicide behavior. Mental health clients scored higher on the BGSIS and on the GSIS-Screen than did participants recruited from community settings, residential facilities, and general hospital settings, consistent with findings of elevated suicide risk among individuals receiving mental health services (see Heisel & Duberstein, 2016).

Research findings are mixed as to whether aging is associated with an increased (Arias et al., 2017; Cukrowicz et al., 2009; Loprinzi & Cain, 2015; Lukaschek, Engelhardt, Baumert, & Ladwig, 2015) or a decreased prevalence of suicide ideation (Almeida et al., 2012; Corna, Cairney, & Streiner, 2010; Johnston, Pirkis, & Burgess, 2009), due in part to differences in setting, culture, methodology, and item-content of assessment tools. The 'oldest-old' (85 years +) participants in the current study generally scored higher than the other age groups on the brief GSIS scales, suggesting that use of an age-specific measure can effectively identify individuals who are contemplating suicide in the context of concerns relevant to later life, including a perceived loss of worth and meaning, and a wish to die. Additional support for the use of the GSIS-Screen was found recently in a community-based upstream intervention study for men facing retirement (Zia, Heisel, Peckham, & Rosen, 2020).

Respondents with the lowest levels of formal education scored significantly higher on the brief GSIS scales than did those with higher levels of formal education. This finding is consistent with those of Oh et al. (2015), and suggests a potentially protective role of formal education, or more generally of socioeconomic status (Milner, Spittal, Pirkis, & LaMontagne, 2013), on risk for suicide. It may also be evidence of an educational bias, as suicide affects all social groups; high levels of social status, education, and wealth do not inoculate against suicidal distress (see Conwell & Heisel, 2012 for a relevant case example).

Suicide ideation and behavior are associated both conceptually (Heisel & Flett, 2016a, 2016b; Links et al., 2005) and empirically with increased risk for death by suicide among older adults (Kim et al., 2012; Suominen et al., 2004; Waern et al., 1999). Construct validity was thus further supported by strong significant differences on all GSIS scales and subscales between study participants who endorsed or denied having ever attempted suicide. These findings are limited by the retrospective nature of this analysis; research is needed to investigate the prediction of future suicide behavior with the GSIS tools.

Those intending to use suicide risk assessment scales for research or clinical purposes are advised to do so in a sensitive and holistic fashion and not to rely exclusively on cut-scores. The ROC curve analyses nevertheless identified possible points of distinction (22 for the BGSIS and 11 for the GSIS-Screen) between older adults with respectively higher or lower levels of suicide ideation. Research is needed testing the validity of these cut-scores with reference to future suicide behavior and other clinical outcomes, bearing in mind the ethical imperative to intervene with individuals at imminent risk for suicide (Mishara & Weisstub, 2005).

Study findings supported the predictive validity of the abbreviated GSIS scales with respect to future suicide ideation. Analysis of the incremental contribution of the different GSIS scales to the prediction of future SSI scores supported the predictive validity of these tools over relatively lengthy periods and showed that although the 5-item GSIS-Screen can predict future suicide ideation, small

albeit significant additional predictive power is gained by use of the longer GSIS scales.

The strengths of the present study must be considered in the context of its limitations, which include use of a combined sample recruited at different points in time, for studies with different aims. Other limitations include a focus on prediction of future suicide ideation rather than suicide behavior or death by suicide, and exclusion of individuals with severe cognitive impairment. Although the GSIS was not designed explicitly for use with older adults with severe cognitive impairment, some of our participants scored at higher levels of cognitive impairment, and this did not appear to undermine the utility of this scale (subgroup analyses available upon request). Sample limitations notwithstanding, use of the combined sample afforded greater statistical power and broader coverage of older adults across settings and contexts. Inclusion of participants from a clinical intervention study (Heisel et al., 2015) increased the prevalence of history of suicide behavior, and inclusion of community-residing participants (Heisel & Flett, 2016a) enhanced generalizability. Research is needed assessing the psychometric properties of the abbreviated scales administered in standalone fashion, rather than selecting-out their items from the full GSIS. Given the growing global burden of dementia (GBD 2016 Dementia Collaborators, 2019), future research is needed to evaluate the psychometric properties and general clinical utility of using the GSIS scales with cognitively-impaired older adults across settings. Prospective studies are also needed to assess the reliability and validity of these measures in large samples of older participants, and identifying their psychometric features in clinical, residential, and community settings, including sensitivity to clinical change among individuals at elevated risk for suicide.

Research findings suggest that detection of suicide risk is highly dependent on the manner in which risk is assessed (e.g. Heisel et al., 2010). Use of well-constructed and validated measures can help in identifying an individual potentially at-risk for suicide (e.g. Regehr, Leblanc, Bogo, Paterson, & Birze, 2015) and support initiation of sensitive discussions about an older adult's life circumstances, feelings, and concerns (Heisel & Flett, 2006). Research findings and clinical guidelines both suggest the need for standardized approaches to detecting suicide risk that are sensitive to the reporting styles of those being assessed (Canadian Coalition for Seniors' Mental Health, 2006). Although not specific to older adults, research findings generally support the practice of screening for suicide ideation and related risk factors in clinical, community, and general population samples (Altura et al., 2016; Boudreaux et al., 2016; Horowitz et al., 2013; Innamorati et al., 2011; Simon et al., 2013; Wu et al., 2016; Von Glischinski, Teismann, Prinz, Gebauer, & Hirschfeld, 2016). Collectively, the current results combine to suggest that the 10-item BGSIS and 5-item GSIS-Screen retain many of the psychometric strengths of the full-length GSIS. These new scales may thus be of value to researchers, clinicians, and public health personnel who seek to quickly identify older adults who may be contemplating suicide and to those who work with older adults who have difficulty sustaining attention or may otherwise be burdened by completing lengthier scales.

Author notes

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Individuals interested in receiving a copy of or using any of the GSIS scales, for education, research, clinical, or any other purpose must contact the first author for permission to do so. These scales may not be used, modified, or translated without the authors' permission.

Disclosure statement

No potential conflict of interest was reported by the authors.

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