Measuring anxiety in the elderly: psychometric properties of the state trait inventory of cognitive and somatic anxiety (STICSA) in an elderly Italian sample

Michela Balsamo,[1] Marco Innamorati,[1] Nicholas T. Van Dam,[2] Leonardo Carlucci[1] and Aristide Saggino[1]

[1]*Department of Psychological Sciences, Humanities and Territory, "G. d'Annunzio" University, Via dei Vestini 30, 66100 Chieti, Italy*
[2]*Nathan S. Kline Institute for Psychiatric Research, Orangeburg, NY 10962, USA*

ABSTRACT

Background: Despite its increasing personal and societal impact, assessment of late-life anxiety has received relatively little attention in psychiatric research. Differential symptom presentation and physical comorbidities among the elderly, relative to younger cohorts creates a need for anxiety measures that are psychometrically validated in the elderly.

Methods: The present study examined the factor structure and discriminant validity of the state-trait inventory for cognitive and somatic anxiety (STICSA) in a sample of Italian middle-aged and older adults. Participants were 396 community-dwelling middle-aged (50–64 years) and older (≥65 years) adults. In addition to the STICSA, participants completed two depression measures and a general well-being survey with physical and mental health subscales.

Results: Factor analysis supported the validity of both state–trait and cognitive–somatic distinctions underlying the STICSA, all dimensions exhibited excellent internal consistency (Cronbach's α coefficients ≥ 0.86), and correlations with depression measures provided limited evidence for differentiation of anxious and depressive symptoms. The STICSA also showed evidence of discriminating anxious symptoms from physical health symptoms, a particularly relevant feature of a valid anxiety measure in elderly samples.

Conclusions: The STICSA appears to be a valid measure of cognitive and somatic anxiety in the elderly.

Key words: anxiety, factor analysis, geriatrics, physical health, depression

Introduction

Late-life anxiety is an increasingly relevant psychiatric condition. With increasing numbers of older adults, anxiety will become an increasing cause of health care utilization contributing to elevated personal and societal costs (Wolitzky-Taylor *et al.*, 2010). Unfortunately, the detection of anxiety disorders in late life is complicated by cognitive decline, newly emergent changes in life circumstances, high medical comorbidity, and a symptom presentation that is markedly different from younger age groups (Magni and DeLeo, 1984; Kogan *et al.*, 2000; Cully *et al.*, 2006; Seignourel *et al.*, 2008; Wolitzky-Taylor *et al.*, 2010; Therrien

and Hunsley, 2012). For many of the above reasons, anxiety disorders in late life are more likely to go unnoticed and untreated relative to anxiety in younger populations. Assessing the presence and severity of clinical anxiety in the elderly is an important challenge for researchers and clinicians alike. However, relatively little is known about the assessment of anxiety in older adults (Ayers *et al.*, 2007).

Self-report measures are by far the most common method of assessment of anxiety (Alwahhabi, 2003; Dennis *et al.*, 2007). Self-report inventories are easily administered and limit patient/participant burden. Approximately 12 different anxiety measures have been identified as commonly used for the assessment of anxiety in older adults (Therrien and Hunsley, 2012). Most of these measures were originally developed and validated in college samples and therefore lack norms and sufficient psychometric evidence for use with older

adults. Additionally, many of these measures fail to capture the unique phenomenology of anxiety in the elderly (Edelstein *et al.*, 2008). For example, an overabundance of somatic items can obfuscate differences between medical and psychological causes of anxiety in this population (Therrien and Hunsley, 2012). Moreover, instruments developed in younger populations should be normed with samples of older adults, providing age-appropriate norms for this population. It is well known that the clinical expression and severity of anxiety symptoms may change with age (Wolitzky-Taylor *et al.*, 2010). Another important issue for the assessment of late-life anxiety is the frequent comorbidity with other mental disorders (Kogan *et al.*, 2000). Particularly, the high comorbidity of anxiety and depression among younger adults (Mineka *et al.*, 1998) becomes even more impressive in older adults, with approximately half of depressed older adults also meeting criteria for an anxiety disorder (Beekman *et al.*, 2000). Thus, anxiety instruments able to disentangle symptoms of anxiety and depression are especially needed among elderly samples.

To address many of these limitations some researchers have investigated the psychometric properties of existing anxiety questionnaires in older adults (such as the abbreviated Penn State Worry Questionnaire (Hopko *et al.*, 2003; Crittendon and Hopko, 2006; Nuevo *et al.*, 2007; Wuthrich *et al.*, 2014) and the Geriatric Anxiety Inventory-short form (Byrne and Pachana, 2011)). Additionally, new measures have been created specifically for use with older adults (e.g. Geriatric Anxiety Inventory; Pachana *et al.*, 2007, Adult Manifest Anxiety Scale-Elderly Version; Reynolds *et al.*, 2003, Geriatric Anxiety Scale; Segal *et al.*, 2010).

Despite the strengths of modified and newly developed measures for use in older adults (e.g. adequate internal consistency, strong convergent validity), these measures present several limitations which may restrict their clinical utility in specific groups of older adults. For example, some of these scales exhibit poor discrimination between anxiety and depression or health-related variables. Some of the aforementioned measures use dichotomous response formats, which can provides less information (when compared to dimensional rating) regarding the severity of symptoms. Finally, many anxiety measures exhibit poor reliability for items assessing physical or sleep disturbances in the elderly, potentially due to difficulty in differentiating anxiety from medical disorders and elevated prevalence of sleep difficulties in later life (Foley *et al.*, 2004; Crittendon and Hopko, 2006; Andrew and Dulin, 2007; Byrne *et al.*, 2008; Diefenbach *et al.*, 2009; Segal *et al.*, 2010; Yochim *et al.*, 2011; Gould *et al.*, 2014; Johnco *et al.*, 2014; Mueller,

2014). Moreover, geriatric anxiety measures cannot be used for investigating anxiety in younger age groups, a particular challenge for studies investigating anxiety across the lifespan. While age-specific measures have their benefits, the availability of general anxiety questionnaires with age-based norms can be preferable to age-specific instruments. Consequently, examination of the psychometric properties in currently available measures of anxiety when used with older adults (in lieu of revising these instruments for age-specific use) is helpful for many of the aforementioned reasons.

The STICSA (Ree *et al.*, 2008) was recently developed to overcome several limitations issues associated with Spielberger's State-Trait Anxiety Inventory (STAI; Spielberger *et al.*, 1983; Kennedy *et al.*, 2001; Therrien and Hunsley, 2012). To date, the STICSA has been shown to have excellent psychometric properties in both nonclinical and clinical samples of adults (Gros *et al.*, 2007; Ree *et al.*, 2008; Gros *et al.*, 2010; Van Dam *et al.*, 2013) and to differentiate anxiety from depression better than other commonly used anxiety measures (e.g. the STAI; Gros *et al.*, 2007). The fact that the STICSA assesses cognitive and somatic dimensions of anxiety, and particularly that it can differentiate anxiety and depression, makes it an attractive tool for assessing anxiety in the elderly.

To our knowledge, no previous studies have investigated the psychometric properties of the STICSA in older adults. Accordingly, our aims were to assess the factor structure and discriminant validity of the Italian version of the STICSA in a sample of middle-aged and older adults. We predicted confirmation of the original four-factor structure (e.g. state vs. trait and cognitive vs. somatic dimensions). Concurrent and discriminant validity were investigated by administering two self-report measures of depression and a measure of quality of life, the latter assessing mental and physical health functioning. Our hypotheses were that: (1) cognitive and somatic subscales of the STICSA are correlated reciprocally more strongly than they are correlated with measures of depression; (2) the STICSA correlates more strongly with mental health functioning than with physical health functioning, indicating the ability of STICSA scores to discriminate between anxiety and physical health issues.

Additionally, we assessed whether age (older adults – 65 years and older – vs. middle-aged adults – 50–64 years old) and sex had an effect on STICSA scores. While there are no clear-cut boundaries between adulthood and late adulthood, 65 years is a common cutoff used for "old age" (Federal Interagency Forum on Aging-Related Statistics, 2012; World Health Organisation, 2014),

Table 1. Descriptive statistics of the sample ($N = 396$)

		COUNT	PERCENTAGE
Women		200	50.5%
Age – M±SD (range) years		69.04 ± 8.41 (51/94)	
Marital status			
	Married	288	72.7%
	Divorced	23	5.8%
	Widowed	62	15.7%
	Single	23	5.8%
Educational attainment – M±SD years		8.12 ± 4.43	
Education ≤ 8 years		265	66.9%
Retired		230	58.1%
GDS – M±SD		8.57 ± 5.55	
TDI – M±SD		21.68 ± 11.88	
SF-12 PCS – M±SD		42.10 ± 9.72	
SF-12 MCS – M±SD		51.13 ± 8.62	

Note. TDI = teate depression inventory; GDS = geriatric depression scale; PCS = SF-12 physical composite score; MCS = SF-12 mental composite score.

corresponding with the age at which one can begin to receive pension benefits in several Western countries. We hypothesized a significant effect of sex, consistent with studies indicating increased risk among older women for an anxiety disorder (Wolitzky-Taylor *et al.*, 2010), as well as with higher scores on trait anxiety among older women relative to men (Bergua *et al.*, 2012).

Methods

Participants

Participants were 396 community-dwelling middle-aged and elderly adults (196 men). Mean age of the sample was 69.04 years (SD = 8.41; 69.08 ± 8.21 and 69.01 ± 8.62, respectively, for men and women; $t(394) = 0.08$; $p = 0.94$). Just under 65% (64.8%) of the sample was 65 years or older. Sociodemographic characteristics of the sample are listed in Table 1. No clinical diagnoses were provided. However, according to the previously reported cut-off scores of the STICSA (Van Dam *et al.*, 2013), 30.8% ($n = 122$) of the participants met criteria for clinical anxiety (STICSA Trait scale total score > 43), while 5.3% ($n = 21$) of the participants met criteria for the possible presence of anxiety disorders (STICSA Trait scale total score > 40).

The sample was recruited through advertisements (*flyers*, newspapers, and online *ads*) posted for established community groups (senior centers, retirement communities, and church groups, which focused on older adults). Study participants contributed voluntarily and anonymously; no honorarium was given for completing the assessments. All participants provided written, informed con-sent. The study was approved by the local institutional review board.

Measures

All participants were administered Italian versions of the STICSA, the Teate Depression Inventory (TDI; Balsamo and Saggino, 2013; 2014; Balsamo *et al.*, 2014), the Geriatric Depression Scale (GDS; Yesavage *et al.*, 1982), and the short-form-12 (SF-12) Health Survey (Ware *et al.*, 1996). All the respondents completed paper-and-pencil versions of the questionnaires in a fixed order (a sociodemographic checklist, the GDS, the STICSA, the SF-12, and the TDI) on site at within established community groups. The protocol was administered by licensed psychologists who had a four-hour training wherein the objectives of the research, characteristics of the instruments administered, and information about common issues in psychological assessment among older adults (e.g. the effects of visual impairment or cognitive deficits on psychological testing) was explained. Since participants anonymously completed the assessments, those who scored highly on the depression and anxiety scales did not receive advice regarding psychological treatment. The STICSA is a 21-item measure designed to assess cognitive (e.g. *"I feel agonized over my problems," "I think that others won't approve of me"*) and somatic (e.g. *"My heart beats fast," "My muscles are tense"*) symptoms. It can be administered in both trait and state variations. In the trait-anxiety subscale, the individual rates how often a statement is true *in general*, whereas in the state-anxiety subscale she/he rates how she/he feels at the moment of assessment. In total, the overall

scale is made up of four subscales: State–Somatic (SS), Trait–Somatic (TS), State–Cognitive (SC), and Trait–Cognitive (TC). Each statement is rated on a four-point Likert-type scale from 1 (not at all) to 4 (very much so). Items of the STICSA were translated into Italian according to standard procedures of forward- and back-translation (van de Vijver and Tanzer, 1997). The translation was performed first from English into Italian and then from Italian into English by two independent bilingual professionals. The translators were two independent bilingual psychologists with previous experience in the cross-cultural validation of mental health measures. The back-translated version of the STICSA was submitted and approved by the author of the original scale (M. Ree, personal communication, February 04, 2013), who did not find any discrepancy in comparison to the original English version.

The GDS is a 30-item self-report questionnaire designed to measure depression in a geriatric population. Items represent symptoms of depression commonly seen in the elderly across affective (e.g. sadness, apathy, crying) and cognitive domains (e.g. thoughts of hopelessness, helplessness, guilt, worthlessness). The GDS does not assess somatic symptoms of depression (e.g. disturbances in energy level, appetite, sleep, sexual interest), which may confer less discriminability between depression and health conditions (Smarr and Keefer, 2011). Respondents rate each item on a dichotomous (yes/no) scale and the total score ranges between 0 and 30, with higher scores indicating more severe depression. In the present sample, Cronbach's α was 0.84.

The TDI is a new 21-item self-report instrument designed to assess major depressive disorder as specified by the latest *editions* of the DSM (DSM-IV-TR and DSM-V; American Psychiatric Association, 2000; 2013) (Balsamo and Saggino, 2013). It was developed via Rasch logistic analysis of responses, within the framework of item response theory (Rasch, 1980; Andrich, 1995), in order to overcome inherent psychometric weaknesses of existing measures of depression, including the BDI-II (Balsamo and Saggino, 2007). Each item is rated on a five-point Likert-type scale, ranging from 0 (always) to 4 (never). A small but growing literature suggests that the TDI has strong psychometric properties in both clinical and nonclinical samples, including an excellent Person Separation Index, no evidence of bias due to item-trait interaction, good discriminant and convergent validity, and control of major response sets (Balsamo and Saggino, 2013, 2014; Balsamo *et al.*, 2013, 2014; Innamorati *et al.*, 2013). In a recent study, three cut-off scores were recommended in terms of sensitivity, specificity,

and classification accuracy for screening for varying levels (minimal, mild, moderate, and severe) of depression severity in a group of patients diagnosed with major depressive disorder (Balsamo and Saggino, 2014). In the present sample, Cronbach's α was 0.88.

The SF-12 is a 12-item SF of the SF-36 (Ware and Sherbourne, 1992). The SF-12 was developed for the Medical Outcomes Study (Stewart and Ware, 1992), a multi-year study of patients with chronic conditions. The instrument was designed to reduce respondent burden while achieving minimum standards of precision for purposes of group comparisons involving multiple health dimensions. The SF-12 assesses health-related quality of life in the last four weeks and covers the same health domains as the original SF-36 with one or two questions per domain, and provides two composite scores of physical (PCS) and mental health (MCS). Internal consistency coefficients were 0.80 and 0.77 for PCS and MCS, respectively.

Statistical analysis

We conducted confirmatory factor analysis (CFA) using the statistical package LISREL 8.7 (Jöreskog and Sörbom, 2006). All analyses were conducted using asymptotic covariance matrices and robust maximum-likelihood estimation methods because the distributions of some model variables deviated from normality.

We tested four possible factor models underlying items of the STICSA: (1) one-factor model in which all (both state and trait, as well as both cognitive and somatic) items were forced to load on a single higher order factor (*Model 1*); (2) two-factor model in which items across the state and trait scales loaded on either cognitive or somatic factors (*Model 2*); (3) two-factor model in which items loaded on either state or trait factors (*Model 3*); and (4) four-factor model in which State-Cognitive (STICSA-SC), State-Somatic (STICSA-SS), Trait-Cognitive (STICSA-TC), and Trait-Somatic factors (STICSA-TS) were directly modeled (*Model 4*).

The fit of each model was assessed by means of the following goodness-of-fit indices: (1) the Satorra–Bentler chi-squared (SB χ^2) statistic and its degree of freedom; (2) the root mean square error of approximation (RMSEA) and its 90% confidence interval (90% CI); (3) the Non-Normed Fit Index (NNFI); (4) the comparative fit index (CFI); and (5) the standardized root mean square residuals (SRMR). In the present study, we considered NNFI, and CFI values of 0.90 and above to reflect adequate fit and values of 0.95 and above to indicate excellent fit. RMSEA and SRMR values of 0.08 or less were considered to reflect adequate fit; values

Table 2. Fit indices for the structural models ($N = 396$)

MODEL	SB χ^2	df	NNFI	CFI	SRMR	RMSEA	90% CI
One factor (*Model 1*)	3,992.55*	819	0.92	0.92	0.085	0.099	0.096/0.100
Two factor, cognitive-somatic (*Model 2*)	2,879.00*	818	0.95	0.95	0.073	0.080	0.077/0.083
Two factor, state-trait (*Model 3*)	3,929.59*	818	0.92	0.92	0.084	0.098	0.095/0.10
Four-factor (*Model 4*)	2,713.13*	813	0.95	0.95	0.070	0.077	0.074/0.080

*$p < 0.001$.
Note. SB χ^2 = satorra and bentler chi-squared test; df = degrees of freedom, NNFI = Non-Normed fit index; CFI = comparative fit index; SRMR = standardized root mean square residual; RMSEA = root-mean-square error of approximation; 90% CI = 90% confidence interval of RMSEA.

of 0.06 or less were considered to reflect good fit (Browne and Cudek, 1993; Hu and Bentler, 1999).

To investigate the psychometric properties of the STICSA, we assessed internal consistency of its scales using Cronbach's α indices. The concurrent and discriminant validity of the STICSA and its factor subscales were examined through Pearson's correlation coefficients. We compared the pairs of correlation coefficients in the analysis of discriminant validity using the approach recommended by Meng *et al*. (1992). A multivariate general linear model (GLM) was used to assess the effect of age (middle-aged adults vs. older adults) and sex (males vs. females) on STICSA scores. Wilks' lambda (λ) and the partial eta squared (η^2) are reported as measures of multivariate effect and effect size, respectively.

Results

Confirmatory factor analysis

Goodness-of-fit statistics for all tested structural models are presented in Table 2. The SB χ^2 goodness-of-fit tests were significant for each of the CFA models (SB χ^2 ranged from 3,992.55, df = 819, to 2,713.13, df = 813, $p < 0.001$). When we investigated the nested models with scaled difference in χ^2 tests (Satorra and Bentler, 1994; Crawford and Henry, 2003; Brown, 2006), Model 4 demonstrated significantly better fit compared to Model 1 [$\Delta\chi^2$ (6, $N = 396$) = 935.95, $p < 0.001$], and both of the two-factor models [Model 2, $\Delta\chi^2$ (5, $N = 396$) = 130.28, and Model 3, $\Delta\chi^2$ (5, $N = 396$) = 823.03 ($p < 0.001$)].

Since the utility of the χ^2 goodness-of-fit test has been questioned, probably due to its sensitivity to large sample sizes (Hu and Bentler, 1998; Kahn, 2006; Kline, 2011), we calculated additional fit indices to support the fit of the models. According to other goodness-of-fit indices, Model 1 and Model 3 generally provided inadequate fit to the observed response data. In contrast, Model 4 yielded adequate-to-excellent fit across all fit indices. A similar pattern was found for Model 2,

which demonstrated adequate fit to the data. Taken together, these results support both the state-trait and cognitive-somatic distinctions implied by the STICSA item pool and instruction sets. Further, the four-factor model seemed to best fit the data, showing the lowest RMSEA value (RMSEA = 0.077; 90% CI: 0.074–0.080), closest to the criterion value of best fit of 0.05 (Schermelleh-Engel *et al*., 2003).

Reliability and validity analysis

All subscales of the STICSA had high internal consistency, with Cronbach's α coefficients of 0.87 and 0.86, respectively for the STICSA-TS and the STICSA-TC, and 0.90 and 0.86, respectively for the STICSA-SS and the STICSA-SC. Cronbach's α coefficients were equal to 0.92 and 0.91, respectively for the STICSA-S and the STICSA-T. In addition, the average inter-item correlations ranged between 0.38 (for the STICSA-TC and the STICSA-TS) and 0.45 (for the STICSA-SS), with STICSA-SC exhibiting an average inter-item correlation of 0.39.

Concurrent and discriminant validity of the STICSA

To investigate the concurrent and discriminant validity of the STICSA, we computed correlations among the STICSA dimensions and with measures of depression and health-related quality of life (see Table 3).

RELATIONSHIPS BETWEEN COGNITIVE AND SOMATIC ANXIETY, AND DEPRESSION
Compared to the somatic scale, the STICSA cognitive scale displayed a significantly higher correlation with the GDS both for the trait scale ($Z = 3.77$, $p < 0.01$) and for the state scale ($Z = 5.41$, $p < 0.01$). No significant differences were detected in the magnitude of the correlations among the STICSA cognitive scale with the TDI compared to the somatic scale, for state ($Z = -1.42$, $p = 0.08$) or trait anxiety ($Z = -1.44$, $p = 0.08$).

Table 3. Correlations among the STICSA, measures of depression, and the SF-12 composite scores (*N* = 396)

MEASURE	1	2	3	4	5	6	7	8	9	10
1. STICSA-Trait		0.92**	0.91**	0.84**	0.73**	0.80**	0.51**	0.63**	−0.29**	−0.48**
2. STICSA-Trait, Somatic			0.67**	0.80**	0.80**	0.65**	0.44**	0.52**	−0.31**	−0.43**
3. STICSA-Trait, Cognitive				0.73**	0.52**	0.82**	0.49**	0.64**	−0.22**	−0.45**
4. STICSA-State					0.91**	0.91**	0.49**	0.57**	−0.32**	−0.44**
5. STICSA-State, Somatic						0.68**	0.43**	0.43**	−0.32**	−0.38**
6. STICSA-State, Cognitive							0.48**	0.61**	−0.26**	−0.44**
7. TDI								0.56**	−0.39**	−0.54**
8. GDS									−0.34**	−0.51**
9. PCS										0.13*
10. MCS										

**p* < 0.01; *p* < 0.05.
Note. STICSA = state-trait inventory for cognitive and somatic anxiety; TDI = teate depression inventory; GDS = geriatric depression scale; PCS = SF-12 physical composite score; MCS = SF-12 mental composite score.

Relationships between cognitive and somatic anxiety, and physical well-being

The STICSA somatic scale displayed a significantly higher correlation with the SF-12 PCS compared with the cognitive scale for trait anxiety ($Z = 3.77$; $p < 0.01$), but not for state anxiety ($Z = 1.57$; $p = 0.06$).

Relationship of cognitive and somatic anxiety relative to relationship among

DEPRESSION MEASURES

All anxiety dimension correlations with depression were weaker than the correlation between measures of depression ($r = 0.56$), with the sole exception of the cognitive dimension of the STICSA and the GDS.

RELATIONSHIP OF ANXIETY DIMENSIONS WITH WELL-BEING

The correlations among the STICSA subscales and the SF-12 composite scores were all negative, indicating that more severe anxiety was associated with lower quality of life. Comparison of the STICSA with the mental and physical health subscales of the SF-12 revealed that STICSA dimensions/subscales were significantly more correlated with the SF-12 MCS than with the SF-12 PCS (Z between -2.02 [$p < 0.05$] and -2.99 [$p < 0.001$]), except for the STICSA-SS ($Z = -0.99$; $p = 0.16$), suggesting the STICSA measures anxiety independently from physical health (Table 3).

Differences between sex and age classes

Descriptive statistics for the STICSA by sex (males vs. females) and age group (middle-aged vs. older adults) are listed in Table 4. Multivariate analyses revealed a significant effect of age (Wilks' $\lambda = 0.97$,

$F(5, 384) = 3.76$, $p < 0.05$, partial $\eta^2 = 0.05$) and sex (Wilks' $\lambda = 0.93$, $F(5, 384) = 5.74$, $p < 0.01$, partial $\eta^2 = 0.07$), but no interaction (Wilks' $\lambda = 0.98$, $F(5, 384) = 1.93$, $p = 0.09$, partial $\eta^2 = 0.02$). Men and women differed on all the dimensions of the STICSA ($p < 0.001$), with women reporting higher scores (partial η^2 ranging from 0.03 to 0.05). Age groups differed only on the STICSA-SS, with older adults reporting higher scores than middle-aged adults (partial $\eta^2 = 0.02$).

Discussion

Some anxiety measures have acceptable psychometric evidence for measuring anxiety in older adults, although the majority may not necessarily differentiate from depression sufficiently well (Dennis *et al.*, 2007; Therrien and Hunsley, 2012). Given the recent establishment of the STICSA as a promising instrument in the assessment of anxiety for its ability to differentiate anxiety from depression, our general aim was to investigate whether it showed psychometric properties sufficient to justify its use in older adults.

In our sample of middle-aged and older adults, the original four-factor structure yielded adequate-to-excellent fit according to established standards in the field (Hu and Bentler, 1999). These findings provide support for the distinctions between state and trait forms of anxiety and between cognitive and somatic anxiety, extending previous findings in younger samples (Gros *et al.*, 2007; Ree *et al.*, 2008; Gros *et al.*, 2010; Van Dam *et al.*, 2013). All dimensions of the STICSA have been found to have excellent internal consistency as reported in previous psychometric analyses carried out in younger samples (Gros *et al.*, 2007; Ree *et al.*, 2008). As regards the investigation on the concurrent and discriminant

Table 4. Descriptive statistics broken down by sex (men vs. women) and age class (middle-aged vs. older adults)

	MALES VERSUS FEMALES $M\pm SD$	F(1)	P	PARTIAL η^2	MIDDLE-AGED VERSUS OLDER ADULTS $M\pm SD$	F(1)	P	PARTIAL η^2	WHOLE SAMPLE $M\pm SD$
STICSA-trait	34.23±10.23 versus 41.55±12.76	25.86	<0.001	0.06	37.58±11.03 versus 38.18±12.73	0.21	0.65		37.93±12.13
STICSA-trait, somatic	17.29±5.41 versus 21.08±7.54	21.92	<0.001	0.05	18.75±6.12 versus 19.46±7.20	1.03	0.31		19.21±6.84
STICSA-trait, cognitive	17.00±5.77 versus 20.49±6.63	20.57	<0.001	0.05	18.86±6.23 versus 18.72±6.59	0.05	0.83		18.77±6.45
STICSA-state	30.81±9.28 versus 36.68±13.24	18.09	<0.001	0.05	32.14±10.46 versus 34.74±12.43	3.36	0.07		33.77±11.81
STICSA-state, somatic	15.04±5.06 versus 18.22±7.57	17.19	<0.001	0.04	15.49±5.51 versus 17.29±7.11	7.17	0.01	0.02	16.65±6.64
STICSA-state, cognitive	15.68±5.35 versus 18.34±6.74	11.94	0.001	0.03	16.55±5.71 versus 17.30±6.50	1.33	0.25		17.03±6.24

Multivariate statistics: Sex: Wilks' $\lambda = 0.93$; $F(5;384) = 5.74$; $p < 0.01$; partial $\eta^2 = 0.07$. Age: Wilks' $\lambda = 0.95$; $F(5;384) = 3.76$; $p < 0.05$; partial $\eta^2 = 0.05$. Sex * Age: Wilks' $\lambda = 0.98$; $F(5;384) = 1.93$; $p = 0.09$; partial $\eta^2 = 0.02$.

validity, according to one first hypothesis, the magnitude of the correlations between the cognitive and somatic subscales of the STICSA would have to be higher than either subscales' correlation with two depression measures, the GDS and the TDI. Previous work has suggested that the STICSA shows promise discriminating anxiety from depression (Gros *et al.*, 2007). In the present study, the correlation among depression measures was higher than correlations between anxiety and depression with the exception of cognitive anxiety (trait and state) and overall trait anxiety with the GDS. Not surprisingly, cognitive anxiety may be associated with measures of depression more strongly than somatic anxiety. While items derived from cognitive dimensions of anxiety (e.g. "*I think the worst will happen,*" "*I feel agonized over my problems*") likely overlap with aspects also common in depressive states, items derived from somatic dimensions of anxiety (e.g. "*My heart beats fast,*" "*My muscles are tense*") likely tap the presence of physiological hyperarousal, which is more uniquely characteristic of anxiety. Despite some overlap with depressive symptoms, cognitive anxiety is an important component of many anxiety disorders (Van Dam *et al.*, 2013). Correlations between cognitive anxiety and the GDS were above 0.60 (0.61–0.64), and they were higher

than the correlation between the two measures of depression (0.56). However, these effect sizes were comparable to those reported by Gros *et al.* (2007), who obtained correlations of 0.59–0.64 between cognitive anxiety and depression, as measured with the Depression Anxiety Stress scales (DASS; Lovibond and Lovibond, 1995). While these figures denote a partially limited ability to discriminate cognitive anxiety symptoms from depression, Gros *et al.* (2007) reported correlations even higher between the STAI and depression (ranging between 0.64 and 0.68).

Also, the elevated correlation between the GDS and the cognitive scales of the STICSA could be due to the fact that the GDS only measures cognitive and affective aspects of depression (not somatic/physical).

According to our second hypothesis, the STICSA would have to be more strongly correlated with mental health functioning than physical health functioning, as measured with the SF-12. We found trait somatic anxiety was more correlated with mental health functioning than with physical health functioning, as assessed by the SF-12. This finding supports the hypothesis that the STICSA might assess anxiety at least partially independently from the presence of physical health limitations, despite a heavy reliance on somatic items. Consistent

with this pattern of correlations, the multivariate GLM indicated a partial independence of the STICSA from age: although older adults are affected more frequently by medical conditions, multivariate analyses indicated a significant, but weak effect of age, with middle-aged adults and older adults showing meaningful differences only for state somatic anxiety. These results are important because the detection of anxiety in older adults is generally complicated by the high frequency of medical disorders present in this age group. Several studies suggest that between 80% and 86% of adults aged 65 years and older have at least one significant medical condition (Dawson *et al.*, 1986; Naughton *et al.*, 2007). Since somatic anxiety may be misidentified as a physical symptom and/or may be resultant from a medical condition, appropriate identification of somatic anxiety in the elderly is critical (Therrien and Hunsley, 2012).

As anxiety appears to have meaningful differences in demographics, between-group analyses for sex were conducted to explore the extent of these differences. Sex had a significant impact on all dimensions of the STICSA in the present sample, with effect sizes greater for trait anxiety than for state anxiety. Compared with males, females reported higher scores on all dimensions of the STICSA, consistent with increased risk among women for an anxiety disorder in older age (Wolitzky-Taylor *et al.*, 2010), as well as with higher scores on the STAI trait subscale among older women relative to male peers (Bergua *et al.*, 2012). Higher STICSA scores for females, compared with males, have also been reported in younger samples (Van Dam *et al.*, 2013).

Limitations and strengths

Several limitations of this study should be addressed in future studies. First, we did not screen the sample for the presence of anxiety disorders thorough diagnostic interviews, and did not assess the ability of the STICSA to discriminate between individuals with anxiety disorders and healthy controls. Second, we did not assess the validity of the STICSA relative to the STAI or other existing measures of anxiety (especially those specifically devised to be used with older adults) (e.g. the Geriatric Mental State Examination; Copeland *et al.*, 1976). Third, we did not assess whether scores on the STICSA were affected by social desirability or the presence of memory impairment and cognitive deficits.

Despite these limitations, our study has several strengths: it is the first study investigating the psychometric properties of the STICSA in a sample of older adults and the first study evaluating the Italian version of this measure, to our knowledge. Furthermore, we also administered to our sample

the SF-12, which shed light on the ability of the STICSA in detecting anxiety symptoms while simultaneously assessing for the presence of physical health symptoms.

Conclusion

In conclusion, the STICSA is a promising measure of general anxiety, which provides a more specific assessment of cognitive and somatic anxiety symptoms among older adults. Together, the present findings support its reliability and validity as a measure of state and trait anxiety in a geriatric population. Nevertheless, our data suggest that the STICSA may have some limitations in discriminating between anxiety and depression. Further studies to investigate its properties relative to other geriatric anxiety measures are necessary. The STICSA may be particularly attractive for researchers and clinicians working with older adults because of its relatively weak association with physical health.

Conflict of interest

None.

Description of authors' roles

M. Balsamo and M. Innamorati contributed equally to the design of the study and supervision of data collection. M. Balsamo, M. Innamorati, and N.T. Van Dam all contributed to drafting of the manuscript. M. Balsamo, M. Innamorati, and L. Carlucci performed statistical analyses. All authors have contributed to and have approved the final manuscript.

References

Alwahhabi, F. (2003). Anxiety symptoms and generalized anxiety disorder in the elderly: a review. *Harvard Review of Psychiatry*, 11, 180–193.

American Psychiatric Association (2000). *Diagnostic and Statistical Manual of Mental Disorders*, 4th edn, text revision ed. Washington, DC: American Psychiatric Association.

American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders*, 5th edn, Arlington, VA: American Psychiatric Association.

Andrew, D. H. and Dulin, P. L. (2007). The relationship between self-reported health and mental health problems among older adults in New Zealand: experiential avoidance as a moderator. *Aging & Mental Health*, 11, 596–603.

Andrich, D. (1995). Models for measurement, precision, and the nondichotomization of graded responses. *Psychometrika*, 60, 7–26.

Ayers, C. R., Sorrell, J. T., Thorp, S. R. and Wetherell, J. L. (2007). Evidence-based psychological treatments for late-life anxiety. *Psychology and Aging*, 22, 8–17.

Balsamo, M., Giampaglia, G. and Saggino, A. (2014). Building a new Rasch-based self-report inventory of depression. *Neuropsychiatric Disease and Treatment*, 13, 153–165.

Balsamo, M., Romanelli, R., Innamorati, M., Ciccarese, G., carlucci, L. and Saggino, A. (2013). The state-trait anxiety inventory: shadows and lights on its construct validity. *Journal of Psychopathology and Behavioral Assessment*, 35, 475–486.

Balsamo, M. and Saggino, A. (2007). Test per l'assessment della depressione nel contesto italiano: un'analisi critica [Tests for depression assessment in Italian context: a critical review]. *Psicoterapia Cognitiva e Comportamentale*, 13, 167–199.

Balsamo, M. and Saggino, A. (2013). *Il Teate Depression Inventory- Manuale di standardizzazione [Teate Depression Inventory, Manual]*ed. Firenze: Hoegrefe.

Balsamo, M. and Saggino, A. (2014). Determining a diagnostic cut-off on the teate depression inventory. *Neuropsychiatric Disease and Treatment*, 10, 987–995.

Beekman, A. T., de Beurs, E., van Balkom, A. J., Deeg, D. J., van Dyck, R. and van Tilburg, W. (2000). Anxiety and depression in later life: co-occurrence and communality of risk factors. *The American Journal of Psychiatry*, 157, 89–95.

Bergua, V. *et al.* (2012). The STAI-Y trait scale: psychometric properties and normative data from a large population-based study of elderly people. *International Psychogeriatrics*, 24, 1163–1171.

Brown, T. A. (2006). *Confirmatory Factor Analysis for Applied Research*ed. New York: Guilford Press.

Browne, M. W. and Cudek, R. (1993). Alternative ways of assessing model fit. In J. S. Long (ed.), *Testing Structural Equation Models* (pp. 136–162) Newbury Park, CA: Sage.

Byrne, G. J. and Pachana, N. A. (2011). Development and validation of a short form of the geriatric anxiety inventory–the GAI-SF. *International Psychogeriatrics*, 23, 125–131.

Byrne, G. J., Pachana, N. A., Arnold, L., Chalk, J. B. and Appadurai, K. (2008). P2-239: performance characteristics of the geriatric anxiety inventory in memory clinic attendees. *Alzheimer's and Dementia*, 4, T441–T442.

Copeland, J., Kelleher, M., Duckworth, G. and Smith, A. (1976). Reliability of psychiatric assessment in older patients. *International Journal of Aging & Human Development*, 7, 313–322.

Crawford, J. R. and Henry, J. D. (2003). The depression anxiety stress scales (DASS): normative data and latent structure in a large non-clinical sample. *The British Journal of Clinical Psychology*, 42, 111–131.

Crittendon, J. and Hopko, D. R. (2006). Assessing worry in older and younger adults: Psychometric properties of an abbreviated penn state worry questionnaire (PSWQ-A). *Journal of Anxiety Disorders*, 20, 1036–1054.

Cully, J. A. *et al.* (2006). Quality of life in patients with chronic obstructive pulmonary disease and comorbid anxiety or depression. *Psychosomatics*, 47, 312–319.

Dawson, P., Kline, K., Wiancko, D. C. and Wells, D. (1986). Preventing excess disability in patients with Alzheimer's disease. *Geriatric Nursing*, 7, 298–301.

Dennis, R. E., Boddington, S. J. and Funnell, N. J. (2007). Self-report measures of anxiety: are they suitable for older adults? *Aging & Mental Health*, 11, 668–677.

Diefenbach, G. J., Tolin, D. F., Meunier, S. A. and Gilliam, C. M. (2009). Assessment of anxiety in older home care recipients. *The Gerontologist*, 49, 141–153.

Edelstein, B. A. *et al.* (2008). Older adult psychological assessment: current instrument status and related considerations. *Clinical Gerontologist*, 31, 1–35.

Federal Interagency Forum on Aging-Related Statistics (2012). *Older Americans 2012: Key Indicators of Well-Beinged*. Washington, DC: U.S. Government Printing Office.

Foley, D., Ancoli-Israel, S., Britz, P. and Walsh, J. (2004). Sleep disturbances and chronic disease in older adults: results of the 2003 national sleep foundation sleep in America survey. *Journal of Psychosomatic Research*, 56, 497–502.

Gould, C. E., Segal, D. L., Yochim, B. P., Pachana, N. A., Byrne, G. J. and Beaudreau, S. A. (2014). Measuring anxiety in late life: a psychometric examination of the geriatric anxiety inventory and geriatric anxiety scale. *Journal of Anxiety Disorders*, 28, 804–811.

Gros, D. F., Antony, M. M., Simms, L. J. and McCabe, R. E. (2007). Psychometric properties of the state-trait inventory for cognitive and somatic anxiety (STICSA): comparison to the state-trait anxiety inventory (STAI). *Psychological Assessment*, 19, 369–381.

Gros, D. F., Simms, L. J. and Antony, M. M. (2010). Psychometric properties of the state-trait inventory for cognitive and somatic anxiety (STICSA) in friendship dyads. *Behavior Therapy*, 41, 277–284.

Hopko, D. R. *et al.* (2003). Assessing worry in older adults: confirmatory factor analysis of the penn state worry questionnaire and psychometric properties of an abbreviated model. *Psychological Assessment*, 15, 173–183.

Hu, L. and Bentler, P. M. (1998). Fit indices in covariance structure modeling: sensitivity to underparameterized model misspecification. *Psychological Methods*, 3, 424–453.

Hu, L. and Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling: a Multidisciplinary Journal*, 6, 1–55.

Innamorati, M. *et al.* (2013). Psychometric properties of the Attitudes toward Self-Revised in Italian young adults. *Depression Research and Treatment*. Available at: http://dx.doi.org/10.1155/2013/209216; last accessed 5 January 2015.

Johnco, C., Knight, A., Tadic, D. and Wuthrich, V. M. (2014). Psychometric properties of the Geriatric Anxiety Inventory (GAI) and its short-form (GAI-SF) in a clinical and non-clinical sample of older adults. *International Psychogeriatrics*, CJO2014. doi:10.1017/S1041610214001586.

Jöreskog, K. G. and Sörbom, D. (2006). *LISREL for Windows [Computer software]*. Lincolnwood, IL: Scientific Software International, Inc.

Kahn, J. H. (2006). Factor analysis in counseling psychology research, training, and practice: principles, advances, and applications. *The Counseling Psychologist*, 34, 684–718.

Kennedy, B. L., Schwab, J. J., Morris, R. L. and Beldia, G. (2001). Assessment of state and trait anxiety in subjects with anxiety and depressive disorders. *The Psychiatric Quarterly*, 72, 263–276.

Kline, R. B. (2011). *Principles and Practice of Structural Equation Modeling*, 3rd ed. New York: Guilford Press.

Kogan, J. N., Edelstein, B. A. and McKee, D. R. (2000). Assessment of anxiety in older adults: current status. *Journal of Anxiety Disorders*, 14, 109–132.

Lovibond, P. F. and Lovibond, S. H. (1995). The structure of negative emotional states: comparison of the depression anxiety stress scales (DASS) with the beck depression and anxiety inventories. *Behaviour Research and Therapy*, 33, 335–343.

Magni, G. and DeLeo, D. (1984). Anxiety and depression in geriatric and adult medical patients. *Psychological Reports*, 55, 607–612.

Meng, X. L., Rosenthal, R. and Rubin, D. B. (1992). Comparing correlated correlation coefficients. *Psychological Bulletin*, 111, 172–175.

Mineka, S., Watson, D. and Clark, L. A. (1998). Comorbidity of anxiety and unipolar mood disorders. *Annual Review of Psychology*, 49, 377–412.

Mueller, A. E. (2014). *Psychometric Properties of the Geriatric Anxiety Scale in Community-Dwelling, Clinical, and Medical Samples of Older Adults*. Department of Psychology Colorado Springs: University of Colorado.

Naughton, C., Feely, J. and Bennett, K. (2007). A clustered randomized trial of the effects of feedback using academic detailing compared to postal bulletin on prescribing of preventative cardiovascular therapy. *Family Practice*, 24, 475–480.

Nuevo, R., Mackintosh, M. A., Gatz, M., Montorio, I. and Wetherell, J. L. (2007). A test of the measurement invariance of a brief version of the penn state worry questionnaire between American and Spanish older adults. *International Psychogeriatrics*, 19, 89–101.

Pachana, N. A., Byrne, G. J., Siddle, H., Koloski, N., Harley, E. and Arnold, E. (2007). Development and validation of the geriatric anxiety inventory. *International Psychogeriatrics*, 19, 103–114.

Rasch, G. (1980). *Probabilistic Models for some Intelligence and Attainment Tests*, Expanded ed. Chicago: University of Chicago Press.

Ree, M. J., French, D. J., Macleod, C. and Locke, V. M. (2008). Distinguishing cognitive and somatic dimensions of state and trait anxiety: Development and validation of the state-trait inventory for cognitive and somatic anxiety (STICSA). *Behavioural and Cognitive Psychotherapy*, 36, 313–332.

Reynolds, C. R., Richmond, B. O. and Lowe, P. A. (2003). *The Adult Manifest Anxiety Scale-Elderly Version (AMAS-E)* ed. Los Angeles: Western Psychological Services.

Satorra, A. and Bentler, E. M. (1994). Corrections to test statistics and standard errors in covariance structure analysis. In A. von Eye and C. C. Clogg (eds.), *Latent Variables Analysis: Applications for Developmental Research* (pp. 399–419) Thousand Oaks, CA: Sage.

Schermelleh-Engel, K., Moosbrugger, H. and Müller, H. (2003). Evaluating the fit of structural equation models: test of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online*, 8, 23–74.

Segal, D. L., June, A., Payne, M., Coolidge, F. L. and Yochim, B. (2010). Development and initial validation of a self-report assessment tool for anxiety among older adults: The geriatric anxiety scale. j*ournal of anxiety disorders*, 24, 709–714.

Seignourel, P. J., Kunik, M. E., Snow, L., Wilson, N. and Stanley, M. (2008). Anxiety in dementia: a critical review. *Clinical Psychology Review*, 28, 1071–1082.

Smarr, K. L. and Keefer, A. L. (2011). Measures of depression and depressive symptoms: beck depression inventory-II (BDI-II), center for epidemiologic studies depression scale (CES-D), geriatric depression scale (GDS), hospital anxiety and depression scale (HADS), and patient health questionnaire-9 (PHQ-9). *Arthritis Care & Research*, 63 (Suppl. 11), S454–S466.

Spielberger, C. D., Gorsuch, R. L., Lushene, R. E., Vagg, P. R. and Jacobs, G. A. (1983). *Manual for the State-Trait Anxiety Inventory STAI (Form Y)* ed. Palo Alto, CA: Consulting Psychologists Press.

Stewart, A. and Ware, J. (eds.) (1992). *Measuring Functioning and Well-being: the Medical Outcomes Study Approach*. Durham, NC: Duke University Press.

Therrien, Z. and Hunsley, J. (2012). Assessment of anxiety in older adults: a systematic review of commonly used measures. *Aging & mental Health*, 16, 1–16.

Van Dam, N. T., Gros, D. F., Earleywine, M. and Antony, M. M. (2013). Establishing a trait anxiety threshold that signals likelihood of anxiety disorders. *Anxiety, Stress, and Coping*, 26, 70–86.

van de Vijver, F. J. R. and Tanzer, N. K. (1997). Bias and equivalence in cross-cultural assessment: an overview. *European Review of Applied Psychology*, 47, 263–280.

Ware, J. E. Jr., Kosinski, M. and Keller, S. D. (1996). A 12-item short-form health survey: construction of scales and preliminary tests of reliability and validity. *Medical Care*, 34, 220–233.

Ware, J. E. Jr. and Sherbourne, C. D. (1992). The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Medical Care*, 30, 473–483.

Wolitzky-Taylor, K. B., Castriotta, N., Lenze, E. J., Stanley, M. A. and Craske, M. G. (2010). Anxiety disorders in older adults: a comprehensive review. *Depression and Anxiety*, 27, 190–211.

World Health Organisation (2014). *Definition of An Older or Elderly Person*. Geneva: WHO.

Wuthrich, V. M., Johnco, C. and Knight, A. (2014). Comparison of the penn state worry questionnaire (PSWQ) and abbreviated version (PSWQ-A) in a clinical and non-clinical population of older adults. *Journal of Anxiety Disorders*, 28, 657–663.

Yesavage, J. A. et al. (1982). Development and validation of a geriatric depression screening scale: a preliminary report. *Journal of Psychiatric Research*, 17, 37–49.

Yochim, B. P., Mueller, A. E., June, A. and Segal, D. L. (2011). Psychometric properties of the geriatric anxiety scale: comparison to the beck anxiety inventory and geriatric anxiety inventory. *Clinical Gerontologist*, 34, 21–33.