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Measurement of Negative Thinking in Patients with Heart Failure: A Critical Review and Analysis

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Abstract

Background—Depression is a significant clinical problem among patients with heart failure (HF). Cognitive therapy is a potential treatment for symptoms of depression in patients with HF. Cognitive therapy focuses on the reduction of negative thinking, a modifiable risk factor for depressive symptoms; however, researchers have not identified the best instrument for measuring negative thinking in patients with HF.

Objective—The purpose of this paper is to review the state of the science in the measurement of negative thinking in order to provide direction for the measurement of negative thinking in patients with HF.

Findings—Three of the most widely used instruments for negative thinking were selected for review. The Crandell Cognitions Inventory, Automatic Thoughts Questionnaire, and Cognitive Checklist- Depression all have strong evidence for validity and reliability. The Crandell Cognitions Inventory (CCI) has the best potential for measuring negative thinking in patients with HF. The CCI has the advantages of being developed with a clinical population and captures a wide range of negative thinking content. However, the CCI is lengthy (45 items) and needs to undergo rigorous psychometric testing among patients with HF before it can be recommended for use.

Conclusions—Future studies are needed to develop a shortened version of the CCI for use in clinical research and to test the CCI's reliability and validity for measuring negative thinking in patients with HF.

Introduction

The purpose of this paper is to present a critical review of the measurement of negative thinking to provide direction for the measurement of negative thinking in patients with heart failure (HF). Negative thinking can be defined as depressive cognitions about the self, world, future, and withdrawal from others.¹ Negative thinking is a cognitive process that is automatic and persistent;² it originates in childhood and dominates the perceptions of the depressed individual.³ Examples of negative thoughts include, "I'm worthless," "Everything I do is a failure," and "Nothing's ever going to work out for me."¹ Although the content of negative thoughts is irrational, these thoughts are believable to the person experiencing them.²

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Negative thinking has several adverse consequences in the general population. First, negative thinking is a risk factor for depressive symptoms,^{4, 5} as well as an independent predictor of the later development of depression among women.^{6, 7} Second, negative thinking exacerbates and maintains depressive symptoms, which contributes to a downward spiral of depressive symptoms that may end in major depressive disorder.^{2, 8} Third, negative thinking independently predicts a worsened response to treatment for depression, even after controlling for history of depression and depressive symptoms at baseline.⁹

Depression is a significant clinical problem in patients with HF. Twenty percent of outpatients with HF suffer from major depressive disorder,¹⁰ and up to 48% of outpatients experience clinically significant depressive symptoms.¹¹ Patients with HF who are depressed have a two-fold greater risk of death or hospitalization compared to patients who are not depressed.¹²

In a recent qualitative study, patients with HF who had depressive symptoms described experiencing negative thinking which exacerbated their depressed mood.¹³ This finding is consistent with Beck's Cognitive Model of depression, which proposes that negative thinking influences the emotional, behavioral, and somatic symptoms of depression.¹⁴ The patients in the qualitative study who experienced depressive symptoms stated that positive thinking was a strategy they used to manage depressive symptoms.¹³ Cognitive Therapy, a treatment for depression which re-directs negative thoughts into positive ones, may be an effective treatment for depression in patients with HF.¹⁵ In order to test the effectiveness of Cognitive Therapy as a treatment for depressive symptoms in patients with HF, researchers need a valid and reliable measure of negative thinking in this population.

Therefore, the objectives of this paper were to provide an overview of the state of measurement of negative thinking, analyze three existing measures of negative thinking, and make recommendations for new directions in the measurement of negative thinking in patients with HF.

Overview of the State of Measurement of Negative Thinking

Negative thinking was first defined in 1967 by Beck, a psychiatrist, as the *cognitive triad*: negative thoughts about the self, world, and future.² Since then, researchers have suggested a fourth type: negative thoughts about interpersonal relationships or withdrawal from others.¹

Endorsement questionnaires are the most common method of measuring negative thinking.¹⁶ These questionnaires contain a list of self-statements or thoughts. Examples of thoughts on an endorsement questionnaire include, "I wish I were a better person," "My life is a mess," and "It's just not worth it."¹⁷ Patients are instructed to rate how often they experience each thought on a Likert scale. Patients usually fill out endorsement questionnaires retrospectively, although a few instruments call for the questionnaire to be administered at the same time as a stressful stimulus.

Endorsement questionnaires are cost-effective, easy to administer, and quick to complete.¹⁶ There are only a few disadvantages to using endorsement questionnaires. A retrospective questionnaire could lead to selective memory bias and socially desirable responses. It is also possible that endorsement questionnaires do not measure the frequency of an individual's actual thought content, but rather the importance of the thought, the similarity of the thought to other ones they may have experienced, or the emotional salience of the thought.^{16, 18} However, researchers have provided evidence supporting the construct validity and concurrent validity of endorsement questionnaires for measuring negative thinking.¹⁸ As a result, endorsement questionnaires remain the most widely used method of measuring

negative thinking in clinical trials. At least 28 endorsement instruments have been developed to measure negative self-statements. Only seven of these instruments are used to measure negative thinking specific to depression. The other instruments measure negative thinking found in conditions such as anxiety, pain, eating disorders, and panic disorder.^{16, 18}

For this paper, three of the most widely used questionnaires that measure negative thinking in depression were selected for review. These instruments include the Crandell Cognitions Inventory, the Automatic Thoughts Questionnaire, and the Cognition Checklist-Depression subscale. The instruments are compared in Table 1, and studies which have examined their psychometric properties are described in Table 2.

Description of Three Existing Measures of Negative Thinking

Crandell Cognitions Inventory

The Crandell Cognitions Inventory (CCI) was developed by Crandell and LaPointe in 1979 to measure self-statements of depression. The authors initially defined depressive thoughts as the *cognitive triad*—negative thoughts about the self, world, and future. A preliminary version of the CCI was developed with a sample of psychiatric inpatients, psychiatric outpatients, and persons without a psychiatric illness, and it contained 81 negative items and 19 non-scored, positive buffer items. Individuals were asked to rate how frequently they experienced each thought on a scale from 1 (almost never) to 5 (almost always); the instructions do not give a specific time frame for thought recall.

The preliminary version of the CCI demonstrated strong evidence of reliability (Cronbach's $\alpha = 0.98$) but possible redundancy among the items. The preliminary version also performed well in discriminating between the three groups; however, the authors felt that the scale was too lengthy to be clinically useful.¹

In 1986, Crandell and Chambless¹ revised the CCI with a sample of depressed psychiatric patients, non-depressed psychiatric patients, and normal controls. Patients were grouped on the basis of the following: Hamilton Rating Scale scores for depression, Maudsley Personality Inventory scores, whether or not the patient was receiving psychological treatment for depression, and whether or not patients had a clinical diagnosis of depression based on the Research Diagnostic Criteria.

The final version of the CCI consisted of 45 items—34 negative self-statements and 11 non-scored positive buffer statements. The authors intended the CCI to have three dimensions: negative views of the self, world, and future, but factor loadings revealed four dimensions: self-rated inferiority (negative view of the self), helplessness (negative view of the world), hopelessness (negative view of the future), and detachment (negative view about withdrawal from others).

The authors stated that the item-total correlations provided support for good internal consistency (exact correlations not reported). The Cronbach's α was 0.95, demonstrating evidence of strong internal consistency reliability, but possible redundancy among items. The sample in which the CCI was initially tested consisted of mostly male participants. Researchers have since used the CCI to measure negative thinking in college women and low-income single mothers, providing evidence of internal consistency of the CCI among women (Cronbach's $\alpha = 0.90$ and 0.97 ; respectively).^{4, 19}

Support for construct validity of the CCI was demonstrated by a strong correlation with depressive symptoms measured by the Beck Depression Inventory ($r = 0.79, p < .001$).¹ Divergent validity was tested by comparing the CCI scores with a measurement of IQ. As

expected, the authors found a moderately low correlation between the CCI and the IQ score ($r = -0.23, p < .05$), supporting divergent validity.

In order to test the construct validity of the CCI among women, Crandell and Chambless¹ investigated the CCI in a sample of 65 outpatients with panic disorder (82% female), since clinically significant levels of depression are common in this population. The authors found a strong correlation between the CCI and the Beck Depression Inventory ($r = 0.77, p < .001$), lending support for convergent validity of the CCI among women. Other researchers have also found evidence for convergent validity of the CCI among women (see Table 2).

Finally, Crandell and Chambless¹ demonstrated that the final version of the CCI had strong evidence of concurrent validity. The total score of the CCI correctly predicted the classification of 92% of the participants among the three groups: depressed psychiatric patients, non-depressed psychiatric patients, and normal controls.

Automatic Thoughts Questionnaire

Hollon and Kendall¹⁷ developed the ATQ in 1980 to measure the frequency of negative automatic thoughts in individuals with depression. The authors defined automatic thoughts as involuntary, stream-of-consciousness cognitions. The items were developed by asking undergraduate students to recall a depressing event. The students were asked to record thoughts or self-statements that “popped into their head.” A total of 100 items were generated for further testing.

After developing the initial items, Hollon and Kendall revised and validated the ATQ with a sample of 348 undergraduate students. Participants were asked to indicate how frequently, the thought occurred over the last week, on a scale from 1 (not at all) to 5 (all the time). Twenty-six students were classified as having clinically significant depressive symptoms according to the Beck Depression Inventory. The authors found that 30 items discriminated between students with and without depressive symptoms. These 30 items were included in the final version of the ATQ. Principal components analysis revealed that the scale contained four dimensions: personal maladjustment and desire for change, negative self-concept and negative expectations, low self-esteem, and giving up/helplessness. The authors state that these four dimensions reflect only two components of Beck's *cognitive triad*: negative views of the self and future.

Hollon and Kendall reported good evidence for internal consistency of the ATQ using split-half ($r = 0.97$) and Cronbach's alpha ($r = 0.96$). Although the strong Cronbach's alphas suggest there could be redundancy among the 30 items, item-total correlations were all significant and ranged from moderate to strong ($r = 0.47 - 0.78$), suggesting that the strong Cronbach's alpha may reflect strong internal consistency rather than redundancy. Harrell and Ryon²⁰ provided evidence for internal consistency reliability, but possible redundancy of the ATQ in a sample that included depressed outpatients and non depressed medical outpatients. Cronbach's alpha was 0.98 for both the depressed and the non depressed groups, while the item-total correlations ranged from 0.56 to 0.91. Wong et al. also provided support for internal consistency of the ATQ (Cronbach's alpha = 0.96) among a sample of Chinese patients with chronic physical illness.²¹

Hollon and Kendall¹⁷ provided support for construct validity of the ATQ. In a sample of undergraduate students, participants with depressive symptoms had higher scores on the ATQ when compared to participants without depressive symptoms (79.6 vs. 48.6, $p < .001$). Further support for the construct validity of the ATQ was found in moderate to strong correlations (exact correlations not reported) with the Beck Depression Inventory and the Minnesota Multiphasic Personality Inventory Depression Scale.

In evaluating divergent validity, Hollon and Kendall¹⁷ hypothesized that there would be a weak correlation between the ATQ and the State-Trait Anxiety Inventory. Surprisingly, there was a strong correlation ($r = 0.79$) between the two scales. The authors suggest that the lack of divergent validity of the ATQ in this sample may have been due to the small number of participants with depressive symptoms (8%) and the frequent comorbidity of anxiety and depressive symptoms.

In contrast, Lamberton and Oei²² reported evidence for the divergent validity of the ATQ in a sample of patients with major depressive disorder. In this study, there was a strong correlation between the ATQ and the Beck Depression Inventory ($r = 0.63$), and a weak correlation between the ATQ and the Beck Anxiety Inventory ($r = 0.17$). Lamberton and Oei suggest that they were able to find support for divergent validity of the ATQ because their sample contained large numbers of both depressed and anxious patients.

Although the ATQ was originally developed with undergraduate students, Harrell and Ryon²⁰ provided evidence for concurrent validity of the ATQ with psychiatric patients. Participants were divided into three groups: a depressed psychiatric group, a non-depressed psychiatric group, and a non-depressed medical patient group. Group assignments were made on the basis of a combination of Beck Depression Inventory scores, the Minnesota Multiphasic Personality Inventory Depression Scale, and clinician depression rating scores. The ATQ scores correctly classified 93% of the patients as depressed psychiatric patients, non-depressed psychiatric patients, or non-depressed medical patients.

Cognition Checklist- Depression

Beck, Brown, Steer, Eidelson, and Riskind²³ developed the Cognitive Checklist (CCL) in 1987 to measure the frequency of negative thinking found in depression and anxiety. The authors defined negative thinking of depression as automatic thoughts, perceptions, and images that center on negative attitudes toward the self, past and future. In contrast, negative thinking of anxiety was defined as automatic cognitions focused on a theme of danger. The authors stated that previous scales, such as the CCI and ATQ, did not adequately differentiate between cognitions found in depression and anxiety. Therefore, Beck et al.²³ designed a depression subscale (CCL-D) and an anxiety subscale (CCL-A) that specifically measure cognitions found in depression and anxiety.

Items for the CCL were derived from collections of automatic thoughts that were recorded by patients in daily thought diaries during Cognitive Therapy treatment. The preliminary version of the CCL contained a total of 43 items. In order to revise the scale and provide evidence of validity, the authors recruited a sample of 618 psychiatric outpatients. The sample was divided into two subsamples: an index sample and a cross-validation sample. All of the patients were diagnosed according to a Structured Clinical Interview. Major depressive disorder was a primary diagnosis in 51% of the index sample and 46% of the cross-validation sample. Generalized anxiety disorder was a primary diagnosis in 24% of the index sample and 35.7% of the cross-validation sample.

Participants were asked to indicate how often each thought occurred to them on a 5-point scale ranging from 0 (never) to 4 (always) when recalling specific situations (attending a social occasion, with a friend, working on a project, and experiencing pain or physical discomfort) and regardless of the situation. No specific time frame was given for the situation recall. During the revision process, the first 212 participants were also asked to label the predominant affect (depression or anxiety) they experienced while thinking each thought. A SPSS Discriminant program was used to determine whether each item was able to discriminate between patients with a primary diagnosis of depression versus anxiety. Items which discriminated between depressed and anxious patients were included in the

CCL-D subscale only if patients labeled the thought as depressing. The final CCL-D subscale contained 14 items, and the CCL-A subscale contained 12 items. The authors conducted factor analysis with the entire CCL scale and found evidence for two dimensions: negative thinking of depression and negative thinking of anxiety. The items on the CCL-D subscale fit into only three of the five recalled situations: attending a social occasion, with a friend, and regardless of the situation.

Results from the cross-validation sample showed good evidence for internal consistency. Cronbach's alpha for the CCL-D was 0.92, and the average item-total correlation was strong ($r = 0.65$).²³ Steer et al.²⁴ also found good evidence for the internal consistency of the CCL-D in a large study that tested the psychometric properties of the CCL-D among undergraduate students and psychiatric outpatients (Cronbach's alpha = 0.90 – 0.93).

Beck et al.²³ provided evidence of construct validity for CCL-D. Although the CCL-D was correlated with both depressive symptoms and anxiety symptoms as measured by the Hamilton Psychiatric Rating Scales, the CCL-D was more strongly correlated with the depression scale ($r = .62$) than with the anxiety scale ($r = .37$). This lends support for both convergent and divergent validity.

Results from a study by Steer et al.²⁴ provide additional evidence for convergent and divergent validity of the CCL-D. The sample consisted of psychiatric outpatients diagnosed with a primary mood disorder (51.6%), a primary anxiety disorder (35.3%), or other psychiatric disorders (13.1%). The authors also tested the CCL-D with a sample of undergraduate students. The results demonstrated that the CCL-D was strongly correlated with the Beck Depression Inventory among both psychiatric outpatients ($r = .66, p < .001$) and undergraduate students ($r = .58, p < .001$). In contrast, the CCL-D had a weaker correlation with the Beck Anxiety Inventory among both psychiatric outpatients ($r = .32, p < .001$) and undergraduate students ($r = .37, p < .001$).

The CCL-D has less evidence for divergent validity among patients who are hospitalized for a chronic physical illness. Clark, Cook, and Snow²⁵ reported that the CCL-D demonstrated divergent validity among psychiatric inpatients; however, when the CCL-D was administered to patients who were hospitalized with a chronic physical illness, the CCL-D was strongly correlated with both depression and anxiety subscales of the Hospital Anxiety and Depression Scale ($r = .60$ and $.69, p < .001$). This indicates that the CCL-D may be less likely to discriminate between negative thinking of anxiety and depression in patients with a chronic physical illness.²⁵

In testing concurrent validity of the CCL, Beck et al.²³ divided patients into a depressed group and an anxious group based on a Structured Clinical Interview and Hamilton Anxiety and Depression Scale scores. Patients were included in the depressed group if they had both a primary diagnosis of depression and a Hamilton Depression Scale score at least 0.5 standard deviation higher than the Hamilton Anxiety Scale score. Similarly, patients were included in the anxious group if their primary diagnosis was anxiety and their Hamilton Anxiety Scale score was at least 0.5 standard deviation higher than the Hamilton Depression Scale score. Using a discriminant classification analysis, the CCL was able to correctly classify 83% of the depressed patients and 79% of the anxious patients.

Researchers have used the CCL-D to compare levels of negative thinking between depressed psychiatric patients and depressed physically ill patients. Clark, Cooke, and Snow²⁵ classified patients as depressed according to the Structured Clinical Interview for the DSM-III. The mean score of the CCL-D was substantially lower in the depressed physically ill group compared to the depressed psychiatric group (12.22 vs. 24.24, $p < 0.05$). Martens et al.²⁶ also found a low level of negative thinking among patients who had recently

experienced a myocardial infarction and were classified as depressed according to a Structured Clinical Interview. The depressed post-myocardial infarction patients had significantly lower scores on the CCL-D compared to psychiatric outpatients (28 vs. 34.9, $p = 0.01$), after adjusting for age, sex, educational level, and marital status. The results from these studies raise the possibility that depressed patients who have recently experienced a myocardial infarction have lower levels of negative thinking than depressed, physically healthy patients; however, these results could also indicate that the CCL-D does not effectively measure negative thinking in patients who are post-myocardial infarction.

Comparison of the Strengths and Weaknesses of the Measures

The three instruments reviewed in this paper each have strengths and weaknesses (see Table 3). All three measures have evidence for internal consistency reliability and four types of construct validity: factorial, convergent, divergent, and concurrent validity. With regard to internal consistency, all three measures demonstrated strong Cronbach's alphas (greater than 0.90) among various populations, providing good evidence of internal consistency reliability. The strong Cronbach's alphas could reflect possible redundancy, but it is also possible that these Cronbach's alphas could be due to strong internal consistency rather than redundancy, as reflected in the item-total correlations reported by some authors.^{23,24}

With regard to factorial validity, a component of construct validity, each instrument displayed a different number of dimensions of negative thinking. The CCI contained four dimensions: the classic *cognitive triad* of negative thoughts of the self, world, future, plus an additional dimension—negative thoughts of withdrawal from others. The ATQ also displayed four dimensions; however, these dimensions reflected only two components of the *cognitive triad*: negative views of the self and future. The CCL as a whole showed evidence of two dimensions: negative thinking of depression and anxiety. The CCL-D subscale was not subjected to its own factor analysis, so it is not known how many dimensions of depressive negative thinking it contains.

The CCI, ATQ and CCL-D all have evidence supporting convergent validity with measures of depressive symptoms. The instruments also have strong support for concurrent validity as evidenced by the ability to discriminate between patients with and without depression; however, the instruments have varying levels of support for divergent validity. The CCI exhibited divergent validity with a measure of IQ, but the authors did not test its divergent validity with anxiety. The ATQ has conflicting evidence regarding its divergent validity with anxiety; therefore, it is not clear whether the ATQ can distinguish negative thoughts of depression from those of anxiety. In contrast, Beck et al.²³ specifically designed the CCL to discriminate between negative thoughts found in depression and anxiety. Since then, researchers have demonstrated strong evidence of divergent validity of the CCL-D with anxiety among clinical and non-clinical populations.

The length of the CCI (45 items) and the ATQ (30 items) make them less practical for use in research and particularly in clinical settings. In addition, researchers have not described whether the 11 positive buffer items on the CCI are necessary. In contrast, the CCL-D is brief (14 items), making it easier to administer in a clinic setting or research trial.

Researchers have yet to provide strong support for the reliability and validity of these three measures among populations with a chronic physical condition, such as in patients with HF. The reliability and validity of the CCI has not been tested in patients with chronic physical conditions. The ATQ has been shown to have good internal consistency reliability among Chinese patients with a chronic physical condition, but its construct validity has not been tested among patients with a chronic physical condition. The reliability and validity of the CCL-D have been tested among patients who are physically ill; however, results from two

studies have demonstrated that depressed patients who are physically ill have significantly lower mean scores on the CCL-D when compared to depressed psychiatric patients.^{25, 26} These results may indicate that depressed patients with a physical illness have lower levels of negative thinking. On the other hand, these results could raise concerns regarding the ability of the CCL-D to effectively measure negative thinking in patients with a chronic physical condition such as HF.

The CCI and CCL-D were developed with a psychiatric population, while the ATQ was developed with undergraduate students. Heart failure is a chronic physical condition that increases in prevalence with age and is the most common reason for hospitalization in elderly adults.^{27, 28} It is possible that the ATQ's items, generated by college students, may not capture negative thinking found in older patients with a chronic physical condition. For example, patients with HF have described negative thoughts such as, "I'm a burden to my family," "I have nothing to offer anymore," and "Useless, I'm just no good."¹³ These thoughts may not be reflected by questionnaires that were developed in physically healthy populations; however, all three instruments have been tested in a variety of populations, including patients with mental illness. Therefore, it may only be necessary to collect more psychometric data to support the reliability and validity of these instruments among patients who have chronic HF.

Recommendations for the Measurement of Negative Thinking in Heart Failure

In summary, the CCI, ATQ, and CCL-D have good evidence of reliability and validity among clinical and non-clinical populations. The CCI has the greatest potential for measuring negative thinking in patients with HF. This instrument has the advantages of being developed with a clinical psychiatric population and captures a wide range of negative thinking content: negative thoughts about the self, world, future, and withdrawal from others. In contrast, the ATQ was developed with undergraduate students, and factor analysis has revealed that it only measures two components of Beck's *cognitive triad*. Although the psychometric properties of the CCI have not been tested among patients with chronic physical illness, the CCI is preferred over the CCL-D because results from several studies raise questions regarding the construct validity of the CCL-D for measuring negative thinking in patients with a chronic physical condition.

Although the CCI demonstrated the best potential for measuring negative thinking in patients with HF, the CCI in its current form is too long to be clinically useful. Future research is needed to develop a shortened version of the CCI for use in clinical research and practice. It is suggested that researchers use a combination of strategies to determine which items to retain, including: exploratory factor analysis, corrected item-total correlations, Cronbach's alpha if the item were deleted, and examination of means and standard deviations of items to examine variability or lack thereof.

Following the development of a shortened version of the CCI, studies are needed to: 1) provide evidence for internal consistency reliability of the CCI as a measure of negative thinking in patients with HF, 2) examine the dimensionality of the CCI via confirmatory factor analysis to determine if the four original dimensions are retained in a sample of patients with HF who have depressive symptoms, 3) provide evidence for convergent validity with depressive symptoms and divergent validity with anxiety among patients with HF, and 4) determine whether the CCI is sensitive to changes in negative thinking in patients with HF as a result of intervention.

Conclusion

Negative thinking is a modifiable target for the treatment of depressive symptoms in patients with HF. In order to determine the effectiveness of interventions designed to reduce negative thinking in patients with HF, researchers need a reliable and valid instrument to measure negative thinking. The CCI has excellent potential for measuring negative thinking in patients with HF. However, research is needed to shorten the CCI and examine its psychometric properties of the CCI among patients with HF before it can be recommended for routine use to measure negative thinking in this population.

Clinical Pearls

- Nurses can target negative thinking as a modifiable risk factor for depressive symptoms in patients with heart failure
- The Crandell Cognitions Inventory has excellent potential for measuring negative thinking in patients with HF
- Research is needed to shorten the Crandell Cognitions Inventory for use in the clinical setting

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Table 1

Description of Three Instruments of Negative Thinking

Instrument (Year)	No. Items	Response Options	Scoring and Range	Sample Item	Normative Values*
Crandell Cognitions Inventory ¹ (1986)	34 negative items, 11 positive buffer items	Indicate the frequency of each thought on a scale from 1 (almost never) to 5 (almost always)	Total scores are scored by summing the item responses to the 34 negative items (11 buffer items are not scored) Range = 34 - 170	I've made such a mess of my life.	<i>Crandell and Chambliss</i> ¹ <ul style="list-style-type: none"> Depressed psychiatric patients: 116 ± 20.1 Non-depressed psychiatric patients: 74.2 ± 21.4 Normal controls: 44.6 ± 8.3
Automatic Thoughts Questionnaire ¹⁷ (1980)	30 negative items	Over the past week, rate the frequency of each thought on a scale from 1 (not at all) to 5 (all the time)	Total scores are calculated by summing the 30 item responses Range = 30-150	It's just not worth it.	<i>Hollon and Kendall</i> ¹⁷ <ul style="list-style-type: none"> Depressed college students: 79.6 ± 22.3 Non-depressed college students: 48.6 ± 10.9 <i>Dozois et al.</i> ²⁹ <ul style="list-style-type: none"> Elderly: 41.6 ± 13.7 Women: 53.5 ± 18.6 Men: 48.4 ± 16 <i>Harrell and Ryon</i> ²⁰ <ul style="list-style-type: none"> Depressed psychiatric outpatients: 88.9 ± 21.2 Non-depressed psychiatric outpatients: 42.4 ± 10 Non-depressed medical outpatients: 38.4 ± 8.2
Cognition Checklist-Depression ²³ (1987)	14 items	Indicate how often each thought occurs on a 5-point scale ranging from 0 (never) to 4 (always) during specific situations (being with a friend or attending a social occasion) or regardless of the situation. No specific time frame is given for the situation recall.	Total scores are calculated by summing the 14 responses Range = 14-70	I don't deserve to be loved.	<i>Beck et al.</i> ²³ <ul style="list-style-type: none"> Depressed psychiatric outpatients: 54.8 ± 9 Anxious psychiatric outpatients: 45 ± 7.7 <i>Martens et al.</i> ²⁶ <ul style="list-style-type: none"> Depressed psychiatric outpatients: 34.9 ± 11.9 Depressed post-MI patients: 28 ± 9.6 Non-depressed post-MI patients: 17.8 ± 8.5 <i>Clark et al.</i> ²⁵ <ul style="list-style-type: none"> Depressed hospitalized medical patients: 12.2 ± 9.1 Non-depressed hospitalized medical patients: 5.1 ± 7.2

Instrument (Year)	No. Items	Response Options	Scoring and Range	Sample Item	Normative Values*
					<ul style="list-style-type: none"> Healthy controls: 4.5 ± 6.2

* Normative values are given as mean $\pm$ standard deviation

Table 2

Psychometric Properties of Three Measures of Negative Thinking

First Author (date)	Purpose	Design	Sample	Reliability	Evidence of Validity	Comments
<i>Crandell Cognitions Index (CCI)</i>						
Crandell ¹ (1980)	To develop a measure of depressive self-statements	Cross-sectional	N = 212 Psychiatric depressed group, psychiatric non-depressed group, normal control group Females 16%	Cronbach's alpha = 0.95	Concurrent validity, convergent and divergent validity, and factor validity were supported	The authors did not describe support for content validity; however, items were developed based on Beck's Cognitive Model of Depression
Crandell ¹ (1980)	To test the validity of the CCI among women	Cross-sectional	N = 65 Outpatients with agoraphobia with panic disorder Female 82%	Not reported	Convergent validity was supported: CCI was strongly correlated with the BDI	This study was reported in the same journal article as above
Peden ⁷ (2000)	To test the effectiveness of a cognitive behavioral intervention on depressive symptoms	Experimental, repeated-measures	N = 92 College women	Cronbach's alpha = 0.95-0.97	Not reported	The intervention group experienced a significant decrease in CCI scores at one month and six months
Peden ⁴ (2004)	To determine predictors of depressive symptoms in low-income single mothers	Cross-sectional	N = 205 Low-income single mothers	Cronbach's alpha = 0.97	Convergent validity: CCI strongly correlated with the BDI, CES-D, Everyday Stressors Index, and Rosenberg Self-Esteem Scale	Divergent validity was not evaluated in this study.
Peden ³⁰ (2005)	To test a cognitive behavioral group intervention on depressive symptoms	Experimental, repeated measures	N = 136 Low income, single mothers	Cronbach's alpha = 0.94-0.97	Not reported	The authors found a decrease in negative thinking in the intervention group at one month and six months
<i>Automatic Thoughts Questionnaire (ATQ)</i>						
Hollon ¹⁷ (1980)	To develop an instrument that measures automatic thoughts of	Cross-sectional	N = 348 College students Female 42%	Split half coefficient = 0.97; coefficient alpha = 0.96; item-total	Convergent validity was supported but divergent validity (with anxiety) was not supported.	There was a low percentage of students with depressive symptoms

First Author (date)	Purpose	Design	Sample	Reliability	Evidence of Validity	Comments
	depression			correlations ranged from 0.47 to 0.78	Factor validity was supported.	(7.5%); depression was not diagnosed with a diagnostic interview
Dobson ³¹ (1983)	To test the psychometric properties of three cognitive assessment scales	Cross-sectional	N = 456 College students Female 49%	Cronbach's alpha = 0.96 (males) and 0.95 (females)	Convergent validity was supported: the ATQ was strongly correlated with the BDI ($r = 0.62, p < .001$)	The ATQ had stronger support for construct validity and reliability than two other cognitive measures: the Dysfunctional Attitude Scale and the Interpretation Inventory
Harrell ²⁰ (1983)	To test the psychometric properties of the ATQ in a clinical sample	Cross-sectional	N = 61 Adult outpatients divided into three groups: depressed, non-depressed psychiatric, and non-depressed patients who were seeking medical care Female 56%	Split-half coefficient = 0.96 Cronbach's alpha = 0.98 Item-total correlations ranged from 0.56 to 0.91 ($p = .001$)	Convergent validity was supported: depressed patients had higher ATQ scores than non-depressed patients. Concurrent validity was supported: ATQ correctly classified 93.1% of patients.	Patients were separated into groups based on BDI scores and a clinical depression rating given by a therapist
Lamberton ²² (2008)	To determine whether anxiety and depression can be differentiated by thought content	Cross-sectional	N = 135 Outpatients with depressive disorder, anxiety disorder, or both Female 55%	Not reported	Convergent and divergent validity were supported: ATQ was strongly correlated with BDI ($r = 0.63, p < .05$) and weakly correlated with the Beck Anxiety Inventory ($r = 0.17, p < .05$)	
Wong ²¹ (2007)	To test the efficacy of cognitive behavioral group therapy on depressive symptoms in patients with chronic physical illness	Randomized, controlled trial	N = 73 Chinese patients with chronic physical illness Female 75%	Cronbach's alpha = 0.96	Not reported	The authors used a Chinese version of the ATQ but did not specify how it was translated and validated
<i>Cognition Checklist- Depression subscale (CCL-D)</i>						

First Author (date)	Purpose	Design	Sample	Reliability	Evidence of Validity	Comments
Beck ²³ (1987)	To develop and test the psychometric properties of the CCL	Cross-sectional	N = 618 Outpatient psychiatric patients Female 55%	Cronbach's alpha = 0.92; Average corrected item-total correlation = 0.65; Test-reliability was tested by administering the CCL-D to 66 patients after six weeks: the correlation between the two scores was 0.76 ($p < .001$)	Convergent and divergent validity were supported: the CCL-D was strongly correlated with the HAM-D ($r = 0.62, p < .001$) and weakly correlated with the HAM-A ($r = 0.37, p < .001$). Concurrent validity was supported: the CCL-D correctly classified 83% of depressed patients	The CCL also contains an anxiety subscale
Steer ²⁴ (1994)	To test the psychometric properties of the CCL in psychiatric outpatients and university students	Cross-sectional	N = 2,197 Psychiatric outpatients ($n = 1,907$) and university students ($n = 290$) Female 58%	Cronbach's alpha = 0.91-0.93; Item-total correlations ranged from 0.56 to 0.85 in the psychiatric sample and 0.41 to 0.72 in the student sample	Factor analysis supported the original two dimensions (anxiety and depression) only in the outpatient group Construct validity was supported: the CCL-D was strongly correlated with the BDI and HAM-D, but only weakly correlated with the Beck Anxiety Inventory and HAM-A.	The results from this study provide additional support for the strong convergent and divergent validity of the CCL-D.
Clark ²⁵ (1998)	To compare depressive and anxious symptoms among physically ill patients and depressed psychiatric inpatients	Cross-sectional	N = 152 Depressed psychiatric inpatients ($n = 75$), hospitalized medical patients with chronic physical illness ($n = 52$), healthy controls ($n = 25$) Female 59%	Not reported	Among medical patients, convergent validity was supported but not divergent validity; the CCL-D was strongly correlated with the BDI and the HADS-D ($r = 0.77, 0.60, p < .001$), but it was strongly correlated with measures of anxiety such as the HADS-A ($r = 0.69, p < .001$). In contrast, the CCL-D showed good evidence of convergent and divergent validity in psychiatric inpatients: the CCL-D was weakly correlated with HADS-A ($r = 0.29, p < .05$).	The CCL-D has stronger support for divergent validity among psychiatric patients compared to medical patients.

First Author (date)	Purpose	Design	Sample	Reliability	Evidence of Validity	Comments
Martens ²⁶ (2006)	To describe level of negative thinking in patients who are post MI	Cross-sectional	N = 120 Non-depressed post MI patients (n = 40), depressed post MI patients (n = 40), and depressed psychiatric outpatients (n = 40). Females = 38%	Not reported	Not reported	The depressed post-MI patients had lower levels of negative thinking than psychiatric outpatients (28 vs. 34.9, $p = .013$) after controlling for age, sex, education, and marital status

BDI = Beck Depression Inventory; CES-D = Center for Epidemiologic Studies Depression scale; HAM-A = Hamilton Rating Scale for Anxiety; HAM-D = Hamilton Rating Scale for Depression; HADS-A = Hospital Anxiety and Depression Scale- Anxiety subscale; HADS-D = Hospital Anxiety and Depression Scale- Depression subscale, MI = myocardial infarction

Table 3

Strengths and Weaknesses of the Three Measures

	Strengths	Weaknesses
Crandell Cognitions Inventory	<ul style="list-style-type: none"> • Captures four dimensions of negative thinking • Evidence for internal consistency • Evidence for convergent and concurrent validity • Developed with a clinical psychiatric population 	<ul style="list-style-type: none"> • Psychometric properties have not been tested among patients with chronic physical illness • Divergent validity with anxiety has not been tested • Possible redundancy • Length (45 items)
Automatic Thoughts Questionnaire	<ul style="list-style-type: none"> • Evidence for internal consistency • Evidence for convergent, divergent, and concurrent validity 	<ul style="list-style-type: none"> • Validity has not been tested in patients with chronic physical illness • Developed with healthy undergraduate students • Captures only two dimensions of the cognitive triad • Possible redundancy • Length (30 items)
Cognitive Checklist-Depression	<ul style="list-style-type: none"> • Evidence for internal consistency • Evidence for convergent, divergent, and concurrent validity • Brevity (14 items) • Developed with a clinical psychiatric population 	<ul style="list-style-type: none"> • Possible redundancy • Evidence for lack of divergent validity among patients with chronic physical illness • Depressed patients with a chronic physical illness have lower scores on the CCL-D than depressed psychiatric patients, raising questions regarding its validity among patients with chronic physical conditions