Raftery Dayle (Orcid ID: 0000-0001-9613-1387)
Kelly Peter (Orcid ID: 0000-0003-0500-1865)
McKetin Rebecca (Orcid ID: 0000-0003-2833-4830)

Measuring cognitive insight in people with problematic substance use: An exploration of the factor validity of the Beck Cognitive Insight Scale

Running title: Exploration of BCIS in substance use

Dayle Raftery, M Prof Psych, PhD Candidate, School of Psychology, University of Wollongong.

Peter J. Kelly, PhD, Associate Professor, School of Psychology, University of Wollongong

Frank P. Deane, PhD, Professor, School of Psychology, University of Wollongong

Rebecca McKetin, PhD, Associate Professor, National Drug Research Institute, Curtin University.

Amanda L. Baker, PhD, Professor, School of Medicine and Public Health, University of Newcastle.

Alyna Turner, PhD, Senior Lecturer, School of Medicine and Public Health, University of Newcastle, and Deakin University, IMPACT Strategic Research Centre, School of Medicine, Barwon Health, and Department of Psychiatry, University of Melbourne.

Olivia Dean, PhD, Associate Professor, Deakin University, IMPACT Strategic Research Centre, School of Medicine, Barwon Health, and Department of Psychiatry, University of Melbourne.

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Author for correspondence: Dayle Raftery, School of Psychology, University of Wollongong,
Wollongong NSW 2500, Australia. Telephone: 02 4221 4981. Email:

dkr034@uowmail.edu.au

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ABSTRACT

Introduction and aims: Insight is a multi-dimensional construct that predicts treatment outcomes of people with mental illness. Research into insight in substance dependent populations is limited and measures of cognitive insight have not been validated for this population. **Design and Methods:** A cross sectional survey was conducted with residents of nine residential substance dependence treatment facilities in Australia. Cognitive insight was assessed using the Beck Cognitive Insight Scale (BCIS). Psychological distress was assessed using the Kessler 6 (K6). **Results:** Participants (N = 312) were primarily male (68.6%), with an average age of 37.51 years (SD = 9.85). Methamphetamine (45.2%) and alcohol (35.9%) were the primary substances of use. A confirmatory factor analysis confirmed the two-factor model of the BCIS (CMIN/DF = 2.91, CFI = 0.84). Removing two items from the Self-Reflection subscale improved model fit (CMIN/DF = 2.71, CFI = 0.84, $X^2_{(22, n=312)} = 76.43$, $p < 0.02$). Internal consistency analyses indicated acceptable internal reliability (Self-Reflectiveness $\alpha = .73$, Self-Certainty $\alpha = .72$, composite $\alpha = .75$). Self-Certainty scores were significantly higher for participants with a self-reported psychotic disorder ($M = 14.95$ vs $M = 13.04$, $p = 0.007$). Self-Reflective scores were higher for people experiencing psychological distress ($M = 17.57$ vs $M = 15.95$, $p = 0.001$). **Discussion and Conclusions:** We found that a 12-item version of the BCIS had good psychometric properties in this substance-using population. Further research is needed to explore whether insight can predict treatment outcomes for substance use.

Key words: insight, substance use, addiction, Beck Cognitive Insight Scale

1. Introduction

Insight is a crucial part of recovery among people living with mental illness [1-3]. There are two primary conceptualizations of insight; clinical and cognitive insight. Clinical insight is centred on a person's awareness of illness, recognition of symptoms as part of the illness, and acknowledgement of need for treatment [4]. Cognitive insight refers to a person's capacity to reflect on their own thought processes, and understanding of their experiences [5]. Clinical insight has been criticised as being easily inflated through people learning to provide the 'right' responses over time [5]. Comparatively, cognitive insight may be harder to falsely inflate [5], given the generally introspective nature of the questions [3].

The Beck Cognitive Insight Scale [BCIS; 5] is a widely used, 15-item measure of cognitive insight. It is comprised of two subscales; Self-Reflection and Self-Certainty. Self-Reflection captures a person's ability to reflect on their own thoughts and behaviours, whereas Self-Certainty refers to a person's inability to accept other's views, or consider alternate explanations. The BCIS has been found to have convergent validity with a number of clinical insight measures [5-7], and has acceptable three week test-retest reliability of the two subscales and the composite score [6]. While initially created for use with people with psychosis, the BCIS has been found to have the same factor structure in a healthy population [8], indicating the measure's capacity to be used outside of a population with psychosis.

Further research has shown the BCIS to have different profiles across populations. In people with depression, there appears to be a relationship with more severe symptoms correlating with higher Self-Reflection scores [3, 9]. In people with bipolar disorder,

cognitive insight varies depending on mood phase, with cognitive insight being lower after a manic state, compared to after a depressive state [10]. The BCIS has further been utilized with people with neurodegenerative disorders [11], bronchial asthma [12], and in healthy populations [8, 13]. The results of these studies indicate that cognitive insight may be useful in populations other than those with a psychotic disorder, such as identifying low insight as a barrier to noticing and acting on symptoms [12]. Given the varied results across different populations, these studies also highlight the importance of understanding the profile of the measure in each population.

To date, the BCIS has not been employed among a substance dependent (SUD) population. Utilizing a measure of cognitive insight, rather than clinical insight, may mitigate current problems with measuring insight in substance use, such as the confounding factor of denial [14]. Studies using a measure of clinical insight with a SUD population highlight that low clinical insight is often associated with false negative reporting of use [14, 15]. The BCIS has previously been critiqued [3] due to the calculation of the composite score, and the current lack of norms regarding what constitutes ‘good’ insight. However, currently there are no other validated measures of cognitive insight.

The utility of the BCIS within people who use substances may also extend to being able to predict treatment outcomes. In particular, the Self-Certainty subscale is likely to be relevant in this population; In a study of Filipinos who use methamphetamine [16], participants who relapsed were generally overconfident of their abilities to avoid substances, which lead to exposure to risky situations. Additionally, the authors noted that “...overconfidence about one’s recovery led to a belief of [just this once], which eventually

led to... a full-blown relapse.” [16, p. 173]. Thus, there appears to be a balance between having some confidence without being overconfident about one’s capacity to manage high risk situations. Exploring a person’s level of self-certainty may make the difference between a realistic evaluation of self-efficacy, and one that is over-inflated and leads to relapse.

The aims of the current study were to;

- (i) Confirm the factor structure of the BCIS in a SUD population through confirmatory factor analysis (CFA).
- (ii) Determine whether psychological distress or presence of psychotic disorder influences BCIS scores in a SUD population. Research has shown the discriminant ability of the BCIS in identifying between those with and without a psychotic disorder [5, 8], and on measures of psychological distress [9]. It is hypothesised that the same discriminant ability will be evident in a SUD population.
- (iii) Explore the relationship of psychosocial factors (e.g., substance of choice, education level, and age) with the BCIS within a SUD population. Existing literature has shown that interpretation of the BCIS can vary depending on the group in focus [3].

2. Method

2.1 Participants

Participants were residents of nine specialist alcohol and other substance use treatment facilities run by The Salvation Army (three services across New South Wales and Queensland) and We Help Ourselves (six services across New South Wales and Queensland).

Treatment programs occur in a modified therapeutic community, are abstinence based, and run for up to 10 months. These services have been described previously [17, 18]. All current residents were approached to participate in the study. There were no exclusion criteria. Of the 346 surveys handed out, 340 were completed (98.2%). The sample was made up of 68.6% men, with an average age of 37.51 years ($SD = 9.85$). Full demographics are in Table 1. Due to ethics procedures, comparison between participants and non-participants is not possible. However, comparison to the Australian AOD National Minimum Dataset [19, 20] indicates our sample is representative of people accessing drug and alcohol treatment in terms of age (median=33 years), gender (67.7% men) and principal substance of concern (within residential treatment: alcohol 38.5%, amphetamines 37.6%).

2.2 Measures

2.2.1 Demographics collected included age, gender, marital status, education and employment history. Participants were asked if they had ever been treated for a mental health problem, any diagnosis, and current mental health medication.

2.2.2. Insight was measured by the BCIS [5]. All 15 items were included in the study and rated on a four-point scale (see Table 2). The BCIS is scored by subtracting the Self-Certainty (6 items) total from the Self-Reflection (9 items) total, giving an overall insight score (range: -18 to 27).

2.2.3 Substance use was collected by asking participants to nominate which substances they had used in the previous 12 months, and to identify their primary substance of concern. Participants were asked how often they used their primary substance prior to

entering treatment. Participants were further asked how long they had been abstinent from all substances (excluding tobacco), and how long they had been in the treatment service.

2.2.4 Psychological Distress was evaluated by the Kessler Psychological Distress Scale [K-6; 21]. This is a 6-item measure of psychological distress over the past month. Scores range from 0 to 24, with 0-7 indicating low distress, 8-12 moderate distress, and 13-24 high distress [22]. The scale has been shown to have excellent reliability [21], and achieved $\alpha=.90$ in the current study.

2.3 Procedure

The research team visited each residential facility during May to August 2017. Participants were provided with a verbal explanation of the study, and a written participant information sheet. Participation was voluntary and anonymous. Participants were informed that completing and returning the surveys would indicate their consent to participate. Participants completed the surveys on their own; however, the research team were available as required. This study received ethics approval from the University of Wollongong Human Research Ethics committee (approval number 2017/115).

2.4 Analysis

Participants with three or more missing data points on the BCIS were excluded from analysis ($n=22$). Of the sample, 18 participants had one ($n=14$) or two ($n=4$) missing data points. The BCIS has previously been analysed with missing responses [23]. Given the self-report nature of the survey, data was screened for effort in responding. Participants who

provided the same response across all items on the BCIS were excluded from analysis, as the nature of the items mean that providing the same response for all items is unlikely to represent a true responder (e.g., Item 7 and 8, see Table 2). Of 340 respondents, 14 did not answer the BCIS, two did not answer enough items, and 12 provided the same answer across the entire measure. Therefore, the following analyses were conducted for 312 respondents.

The most non-responses on any one item of the BCIS was four (Item 3). Little's MCAR test indicated the missing data was missing completely at random ($\chi^2_{(206, n=312)} = 192.79, p = .74$). Less than 5% of the data was missing, indicating that imputation method would have little impact on the results [24, 25]. As the CFA required a complete dataset, and imputation would have little impact, it was decided to impute by single imputation based on series mean.

The CFA was conducted on the BCIS using AMOS Version 21. The CFA was compared to the factor analyses conducted in Beck et al. [5] and Martin et al. [8]. As per recommendations [26], model fit was estimated using chi square, the root mean square error of approximation [RMSEA; 27], comparative fit index [CFI; 28], and the non-normed fit index [NNFI; 29]. Reliability analyses assessing internal consistency were conducted using Cronbach's alpha for each subscale, and the whole scale.

T-tests were performed to determine if there was a significant difference in insight scores between those with and without psychological distress and between those who self-reported a lifetime diagnosis of a psychotic disorder and those who did not. It was initially planned to examine differences between all nominated substances, however alcohol ($n = 110$)

and methamphetamine (n=138) were overwhelmingly nominated as the primary substance of choice (e.g., the next most common substance was heroin, n = 33). Therefore, a t-test was performed to determine any differences in BCIS scores between methamphetamine and alcohol. Correlations examined the associations between insight and age, gender, length in program, abstinence length, education level, drug use frequency, and K-6 total. The significance level was set at $p = .01$ to reduce risk of Type 1 error, and effect sizes were calculated for t-tests.

3. Results

3.1 Substance Use

Most people reported using their substance of choice at least once per day (84.7%) prior to entry to the residential facility, with the majority of the sample reporting multiple daily use (55.8%). Almost half of the sample identified methamphetamine (45.2%) as their primary substance of choice, followed by alcohol (35.9%), heroin (12.2%), cannabis (9%), prescription medication (3.5%), cocaine (2.6%), and other substances (1.6%). Within this sample, 10.9% identified more than one primary substance. In the 12 months prior to the survey, 78.2% had used alcohol and 65.4% had used methamphetamine.

3.2 Mental Health

Of the respondents, two thirds had previously received treatment for a mental health problem. The most common self-reported diagnosis was depression (37.2%), followed by anxiety (23.7%), post-traumatic stress disorder (8%), bipolar disorder (7.7%), a psychotic

disorder (7.4%), with other disorders (e.g., attention deficit/hyperactivity disorder, or a personality disorder) making up 8.3% of the sample.

The mean score on the K-6 was 8.58 (SD=5.21) with almost half of the sample (48.7%) in the low distress category, 28.9% moderate distress, and 22.2% high distress. This is comparable to national survey data [30] for people with a lifetime substance use disorder with 12 month symptoms (K-10: 48%, 26%, and 25% respectively).

3.3 Factor Analysis of BCIS

A two-factor model was created to run the CFA. Factor loadings are shown in Table 2. The items were loaded onto either Self-Reflection or Self-Certainty as per Beck's [5] original model. Several modification indices were indicated regarding covariances between the error terms for items 8, 12, 14, and 15. The error terms for items 1 and 4 also covaried. All of these items belonged to the Self-Reflective factor. These modifications were included in the next model, and the model was tested again. Examining the fit indices showed that some indices reached cut off thresholds, while others did not (see Table 3). Based on the covariances between residuals in this model, it was decided to test the presence of a third factor in the model. Items 8, 12, 14 and 15 were loaded onto a third factor. The resulting model produced fit indices similar to the original model, and a chi-square test indicated that the three-factor model was not a significantly better fit ($X^2_{(2, n=312)} = 4.19, p > 0.05$). It was noted that items 12 and 14 had low loadings (Table 2) and so were removed from the two-factor model. Removing these items resulted in a significantly improved model fit ($X^2_{(22,$

$n=312$) = 76.43, $p < 0.02$). Therefore, the best model fit was a two factor model excluding items 12 and 14.

3.4 Internal Consistency

Reliability analyses were run for both the full scale and without items 12 and 14. Including all items, reliability for the Self-Reflection subscale, $\alpha = .72$, Self-Certainty $\alpha = .72$ and the whole scale achieved $\alpha = .75$. Excluding items 12 and 14 produced similar results, with Self-Reflection achieving $\alpha = .73$, Self-Certainty $\alpha = .72$ and the whole scale $\alpha = .75$. This is comparable to the alphas achieved by Beck et al. [5] and Martin et al. [8]. The average Self-Reflection score was 13.20 (SD = 4.42, range 0 to 27; item average = 1.42, SD = 0.47) and Self-Certainty was 7.10 (SD = 3.28, range 0 to 18; item average = 1.19, SD = 0.55). The average composite score was 6.10 (SD = 4.90, range -7 to 21). Excluding items 12 and 14 brought the average Self-Reflection score down to 9.73 (SD = 3.77, range 0 to 21; item average = 1.33, SD = 0.52) and the mean composite score became 2.63 (SD = 4.42, range -10 to 16). Self-Certainty remained unchanged. Table 4 compares the current BCIS scores to Beck et al. [5], Engh et al. [23] and Martin et al. [8] samples. It is important to note the large difference in sample sizes. The current sample were significantly less Self-Reflective than a bipolar ($t_{402} = -2.82$, $p = .005$, $d = 0.32$) and a healthy sample ($t_{403} = -2.32$, $p = .02$, $d = 0.27$), with less overall insight compared to a healthy sample ($t_{403} = -2.24$, $p = .03$, $d = 0.26$). There was no significant difference between the current sample and a schizophrenia sample.

3.5 Discriminant Ability of the BCIS

The following analyses were conducted excluding items 12 and 14.

Participants were categorised as ‘distressed’ or ‘not distressed’ based on the cut off score of 13 on the K-6 [21]. There was a significant difference on the Self-Reflection subscale with distressed participants scoring higher ($M = 11.03$, $SD = 3.43$) than non-distressed participants ($M = 9.35$, $SD = 3.79$), $t_{(309)} = 3.31$, $p = 0.001$, $d = 0.46$. There was also a significant difference on the BCIS composite between these two groups with the distressed group ($M = 3.91$, $SD = 3.59$) scoring higher than the non-distressed group ($M = 2.26$, $SD = 4.58$), $t_{(309)} = 2.77$, $p = 0.006$, $d = 0.40$. There was no significant difference between the groups on the Self-Certainty scale.

There was a significant difference in scores on the Self-Certainty index with those with a self-reported psychotic disorder ($n = 23$, $M = 8.91$, $SD = 3.20$) scoring significantly higher than those without ($n = 155$, $M = 7.01$, $SD = 3.11$), $t_{(176)} = 2.73$, $p = 0.007$, $d = 0.60$. No significant differences were found for either the Self-Reflection subscale or the composite index.

3.6 Relationship between BCIS and Psychosocial Variables

There was a small, though significant, relationship between K-6 total and Self-Reflection ($r = .33$, $p < 0.001$), and between K-6 total and BCIS total ($r = .26$, $p < 0.001$). There were no other significant correlations.

T-tests indicated there were no significant differences between participants who primarily use alcohol compared to those who use methamphetamine on either subscale, or the composite score.

4. Discussion

The current study set out to explore the use of the BCIS within a sample of substance dependent individuals. Overall, the CFA supported the two-factor structure of the BCIS within a SUD population, although the exclusion of items 12 and 14 may best capture cognitive insight in this population.

The suggested exclusion of item 12 ('If somebody points out that my beliefs are wrong, I am willing to consider it') and item 14 ('There is often more than one possible explanation for why people act the way they do') is not entirely unexpected. Both Beck et al. [5] and Martin et al. [8] achieved relatively low loadings for these items (Beck et al.: .44, .33; Martin et al.: .23, .38 respectively). A third study [7] of an older population with a psychotic disorder achieved .08 loading for item 14, however removing it reportedly did not improve model fit and reasons why this item was poorly aligned were not discussed. In another study [31], items 12 and 14 aligned more strongly with Self-Certainty. It may be the case that there is something within these items that does not strongly reflect the concept of Self-Reflection, and this is more pronounced in a SUD population, particularly in treatment. On face value, the content of items 12 and 14 relate to relationships with others, and ability to consider other people's viewpoints. Changes to social networks, and social identity, is recognised as a pivotal part of recovery from addiction [32, 33]. Items 12 and 14, which could be argued to

be related to value placed on relationships, may elicit differing responses for people in substance use treatment. Further research is needed to determine if these items are similarly interpreted in people who are using substances but not seeking treatment.

Concordant with previous research [3, 9], participants in the current study who scored higher on the K-6 also scored higher on the Self-Reflection subscale. The current results also supported the discriminant ability of the BCIS for psychosis [5, 8], as people with a self-reported psychotic disorder scored significantly higher on the Self-Certainty subscale than those without. These results should be interpreted cautiously due to the diagnosis being self-reported, however, it is a positive indicator of the validity of using the BCIS within a SUD population. It is perhaps a positive note that there were no significant differences in insight across different substances, as this may allow for broader generalizability within a SUD population. Further research should be conducted regarding generalizability given the small numbers of participants who nominated substances other than alcohol or methamphetamine in the current study. A further point of support for the BCIS was that most people were able to answer the full questionnaire, showing no difficulties with the “unusual experience” questions.

There were a few limitations to the present study that may have affected the results. First, survey data were self-reported and anonymous so there is no sure way to ascertain level of engagement with the survey. Although screening rules were applied, it remains possible that inaccurate responses were included in final analyses. This encompasses the handling of with missing data. The amount of missing data was small, but the use of single imputation as opposed to a more rigorous method [34] may have affected the results. Secondly, it is

important to note that participants had been abstinent from their substance of choice for an average of three months at the time of taking the survey, and were engaged in substance dependence treatment. Therefore, the results may not generalise to people who are actively using substances. Our sample size for the purpose of a CFA was at the lower recommended limit, which may have impacted current results. Despite this concern our sample was larger than that of the original study [5]. A further limitation is the lack of other insight measures with which to confirm concurrent validity. This was due to the BCIS being one measure within a larger survey, thus to reduce burden an additional insight measure was not included. As the BCIS has previously been validated [5, 8], the current study focused on confirming the factor structure of the measure within a SUD population.

The results of the current study indicate that the BCIS may be appropriate for use with a SUD population. Future studies within a SUD population should interpret the BCIS with care and consider conducting their own measures of validity, including assessing the function of withdrawal on insight. Poor executive functioning in schizophrenia may be related to lower insight scores on clinical measures [35, 36]. Currently, it is unclear what role acute withdrawal from substances has in the measurement of insight. Research on insight in SUD populations has primarily involved people in treatment for substance use, and so have been abstinent for some time, as in the current sample. Future research should consider utilizing participants who are not actively engaged in treatment or in a controlled environment. It could be argued that those in treatment voluntarily are there because they have some level of insight into the nature of their problems. It is currently unknown whether people compelled to attend treatment (e.g., under court order) have differing insight to those who attend

voluntarily. These kinds of referrals make up anywhere from 9% to 56.4% of the population across treatment types [20] so exploring the role of insight in this subset is important.

Cognitive insight may be critical for improving understanding of addiction and aiding design of effective interventions. For example, within substance dependence treatment, retention rates and treatment compliance are a common challenge [37, 38]. For those with low insight, a therapy focussed on metacognition may be a beneficial adjunct to traditional treatment [39]. Cognitive insight is overlooked in SUD populations, but may be important to improving treatment retention rates, and reducing subsequent relapses.

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Table 1. Demographics and clinical characteristics of participants attending residential treatment for substance dependence (N=312)

	N	Mean (SD)	Percent
Age	312	37.51 (9.85)	
Gender			
Male	214		68.59
Female	97		31.09
Unknown	1		0.32
Aboriginal or Torres Strait Islander			
Aboriginal	29		9.83
Torres Strait Islander	1		0.34
Both	6		2.03
Other	4		1.36
Not ATSI	255		86.10
Education			
Less than high school	112		35.90
Completed high school	62		19.90
TAFE/Trade	103		33.01
University	35		11.22
Years of problem substance use		18.05 (9.78)	
Length in treatment (weeks)		10.81 (12.09)	

Previously sought treatment	201	64.42
Abstinence period (weeks)	13.41 (12.00)	

Table 2. Factor Analysis of the Beck Cognitive Insight Scale

	Beck et al [5]		Current Study	
	Factor 1	Factor 2	Factor 1	Factor 2
1. At times, I have misunderstood other people's attitudes towards me.	0.58	0.07	0.39	
2. My interpretations of my experiences are definitely right.	0.12	0.49		0.38
3. Other people can understand the cause of my unusual experiences better than I can.	0.43	0.11	0.36	
4. I have jumped to conclusions too fast.	0.63	0.19	0.58	
5. Some of my experiences that have seemed very real may have been due to my imagination.	0.59	0.19	0.82	
6. Some of the ideas I was certain were true turned out to be false.	0.66	0.04	0.78	
7. If something feels right, it means that it is right.	-0.06	0.64		0.60
8. Even though I feel strongly that I am right, I could be wrong.	0.57	-0.24	0.24	
9. I know better than anyone else what my problems are.	0.11	0.61		0.59

10. When people disagree with me, they are generally wrong.	0.08	0.67	0.60
11. I cannot trust other people's opinion about my experiences.	0.15	0.63	0.56
12. If somebody points out that my beliefs are wrong, I am willing to consider it.	0.41	-0.10	0.06
13. I can trust my own judgment at all times.	-0.12	0.25	0.55
14. There is often more than one possible explanation for why people act the way they do.	0.33	-0.19	0.06
15. My unusual experiences may be due to my being extremely upset or stressed.	0.50	0.18	0.38

Note. Item scale: (0) 'I do not agree at all', (1) 'Agree Slightly', (2) 'Agree a lot', (3) 'Agree completely'

Table 3. Goodness of Fit indices for the three BCIS models.

	χ^2	df	p	CMIN/DF	RMSEA (90% CI)	CFI	NNFI
a) Two factor	244.14	84	< 0.001	2.91	0.078 (0.067 - 0.090)	0.84	0.81
b) Three factor	248.33	86	<0.001	2.89	0.078 (0.067 - 0.089)	0.81	0.84
c) Two factor without items 12, 14	167.71	62	<0.001	2.71	0.074 (0.061 - 0.088)	0.84	0.88
Good-fit model			>0.05	<3	<0.06	>0.80	>0.90

Note. $n = 312$. RMSEA = root mean square error of approximation; CFI = comparative fit index; NNFI = non-normed fit index.

Table 4. Comparison of BCIS scores across substance dependent, psychiatric and non-clinical samples

	Current Study (n=312) (substance dependence)	Beck et al. (n=32) (schizophrenia)	Engh et al. (n=92) (bipolar disorder)	Martin et al. (n=93) (healthy population)
Self-Reflection	13.20 (4.42)	12.97 (5.00)	14.7 (4.7)**	14.41 (4.36)*
Self-Certainty	7.10 (3.28)	7.94 (3.78)	7.4 (3.0)	7.02 (3.36)
Composite	6.10 (4.90)	5.03 (5.76)	NR	7.39 (4.79)*

Note. Totals for the current study were calculated for all 15 items, to allow comparison. T-test conducted comparing current study to Beck, Engh, Martin. * $p < .05$, ** $p < .01$.

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Author/s:

Raftery, D;Kelly, PJ;Deane, FP;Mcketin, R;Baker, AL;Turner, A;Dean, OM

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