Construct validity of the Beck Hopelessness Scale (BHS) among University Students: A multitrait–multimethod approach

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Abstract

There is considerable debate about the underlying factor structure of the Beck Hopelessness Scale (BHS) in the literature. An established view is that it reflects a unitary or bi-dimensional construct in non-clinical samples. There are, however, reasons to reconsider this conceptualisation. Based on previous factor analytic findings from both clinical and non-clinical studies, the aim of the present study was to compare 16 competing models of the BHS in a large university student sample (N = 1, 733). Sixteen distinct factor models were specified and tested using conventional confirmatory factor analytic techniques, along with confirmatory bifactor modelling. A 3-factor solution with 2 method effects (i.e., a multitrait–multimethod model) provided the best fit to the data. The reliability of this conceptualisation was supported by McDonald's coefficient omega, and the differential relationships exhibited between the three hopelessness factors ('Feelings about the Future', 'Loss of Motivation', and 'Future Expectations') and measures of goal disengagement, brooding rumination, suicide ideation, and suicide attempt history. The results provide statistical support for a three-trait and two-method factor model, and hence the three dimensions of hopelessness theorised by Beck. The theoretical and methodological implications of these findings are discussed.

Keywords: Beck Hopelessness Scale (BHS); Confirmatory Factor Analysis; Bifactor Modelling; Multitrait–Multimethod; Suicide.

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Hopelessness is part of the cognitive triad of depression (Beck, Rush, Shaw, & Emery, 1979), and has been defined as a system of negative beliefs and expectancies concerning oneself and one's future (Stotland, 1969). Importantly, hopelessness is one of the most reliable predictors of suicide attempts and death by suicide (McMillan, Gilbody, Beresford, & Neilly, 2007; O'Connor & Nock, 2014). Thus, determining the underlying structure of this construct is crucial to more accurately identify and intervene with at-risk individuals.

The Beck Hopelessness Scale (BHS) is a 20-item self-report scale that was developed to operationalize hopelessness (Beck & Steer, 1989; Beck, Weissman, Lester, & Trexler, 1974). Beck et al. (1974) carried out the first test of the psychometric properties of the BHS using data drawn from suicide attempters ($N = 294$) and derived a three-factor solution. According to Beck and colleagues, the three extracted factors (an "affective", a "motivational", and a "cognitive" component) made sense clinically. Although not discussed by Beck et al., the influence of item phrasing on this factor solution has been noted by others (Steed, 2001), leading some researchers to propose that the positively worded items reflect "optimism"; whereas, the negatively worded items reflect "pessimism."

The findings of extant studies of the factor structure of BHS across varied samples are summarised in Table S1. Within clinical populations, for whom the scale was developed, it has been proposed that a three-factor structure is the most appropriate (Rosenfeld, Gibson, Kramer, & Breitbart, 2004). However, it has been suggested that this factorial solution may be largely based on the number and phrasing of items (Steed, 2001). Moreover, the large proportion of variance accounted for by the first factor (e.g., Young, Halper, & Clark et al., 1992) and the high correlations between factors (e.g., Chang et al., 1994; Young et al., 1992) could be seen as an argument for the adoption of a unidimensional solution (Steed, 2001).

Close inspection of the studies supporting multidimensional structures also reveals that the majority of positively worded items tend to load onto one factor, while most of the negatively worded items ted to load onto the second and third factors (Beck et al., 1974; Dyce, 1996; Hill et al., 1988). This pattern indicates that a methodological artefact may be present. Thus, in clinical samples, the BHS may in fact reflect a unitary construct of hopelessness, as well as method effects resulting from item wording.

Two recent studies have attempted to take into account method variance to further our understanding of the latent structure of the BHS. Innamorati, Lester, and Balsamo et al. (2013) reported that a one-construct two method model (i.e., the BHS measures one substantive hopelessness construct plus artefacts due to negative–positive item polarity) had the best fit indices and was more parsimonious than other one-, two-, and three- factor models tested, in a sample of 514 Italian medical patients. Szabó, Mészáros, and Sallay et al. (2015) also concluded that the BHS (18 items) measures a single underlying construct of hopelessness, with method effects resulting from item wording.

It has been suggested that a unidimensional or bidimensional structure may be preferable in nonclinical populations where hopelessness is not as well established as in clinical samples (Tanaka, Sakamoto, Ono, Fujihara, & Kitamura, 1998). Chang et al. (1994) conducted both exploratory and confirmatory factor analysis on data collected from 389 US undergraduate psychology students. The authors reported both a one- and two-factor structure fitted their data adequately, but the former solution was more appropriate due to the large correlation (r = -.93) between the two latent factors. Steed (2001) also conducted both exploratory and confirmatory factor analysis on data collected from undergraduate students, and set out to compare systematically alternative factor models. Their exploratory factor analysis (EFA) revealed a four-factor solution to the data, but the authors noted that that this model was ‘largely uninterpretable’. As the first factor explained most of the variance, a one-

factor model was deemed more appropriate. However, a subsequent CFA, which compared several alternative one- and two-factor models, indicated that none of the models tested provided adequate fit to the data, leading to the conclusion that the BHS may have limited utility in 'normal populations'. The possibility of limited utility in 'normal populations' was also raised by Young et al. (1992), who suggested that the BHS was relatively insensitive at lower levels of hopelessness. Glanz, Haas, and Sweeney (1995) posited that lower sensitivity might be a result of higher social desirability, which is frequently observed in non-clinical samples. Using data drawn from 340 Italian undergraduate students, Pompili and Tatarelli (2007) reported that CFA did not provide support for Beck's original three-factor structure but a subsequent EFA suggested a six-factor model, which was subsequently reduced to a two-factor model due to insufficient factor loadings. This model was not subject to CFA. Hanna et al. (2011) employed CFA with Diagonally Weighted Least Squares to investigate the factor structure of the BHS in a sample of UK undergraduate students. A one-factor solution was reported to be the best fit to their data, although they noted that two- and three-factor models provided an acceptable fit. Pompili et al. (2009) applied CFA to data from 577 Italian students, and found support for the one-factor model.

Possible reasons for the heterogeneity of findings between studies include the variety of analytic and extraction methods employed (EFA, CFA, Principal Components Analysis [PCA]), scale translations (Greek, French, and Swedish), differences between populations sampled (clinical, medical patients, students) and, in some studies, insufficient sample size. One reason in need of further consideration in particular is differences in analysis. Pompili and Tatarelli (2007), for instance, employed EFA which seeks to identify the number of common factors underlying a large number of items and interprets them on the basis of the semantic content of the items loading on them. This *post-hoc* interpretation is subjective and often differs between researchers. Furthermore, unlike PCA, it does not attempt to eliminate

error variance from the factor matrix and, consequently, the results may be less generalizable (Kline, 1998). Importantly, items on the BHS have a binary (yes/no) response format, thus, analytic techniques that are able to handle categorical data must be used, such as mean- and variance-adjusted weighted least squares parameter estimates (WLSMV) (Muthén & Muthén, 1998–2010; Yu, 2002). To date, however, only two studies have used this method of analysis (Aish & Wasserman, 2001; Szabó et al., 2015).

The current study

In response to calls for more research to confirm the construct of hopelessness (Glanz et al., 1995), especially in non-clinical populations (Steed, 2001), our aim is to provide a more accurate determination of the optimal number of factors necessary to explain the dimensionality of BHS scores. To achieve this, we investigate a series of theoretically plausible models of the underlying structure of the BHS, including bifactor and multitrait-multimethod (MTMM) models, which have not previously been empirically tested, but are in-line with theoretical formulations. By carrying out the most comprehensive investigation of the underlying factor structure of BHS tests scores, we hope to reconcile conflicting findings and provide a statistically and conceptually meaningful solution.

Methods

Participants

Participants (N = 1733) were 1,287 female and 446 male university students recruited from various faculties in three UK universities. Participants were aged between 18 and 45 years (M = 22.86; SD = 5.79). One thousand three hundred and thirty eight participants identified themselves as White (77.2%), 223 as Asian (12.9%), 70 as Mixed (4%), 64 as Black (3.7%), and 36 as other (2.1%). Two of the participants did not give any information regarding their race. The sample size was further reduced to N = 1651 after listwise deletion of missing data (data were missing at random, Little's MCAR test: p = .28).

Measures

Hopelessness. The BHS (Beck et al., 1974) is a 20-item that combines 11 negatively worded items (e.g., ‘‘my future seems dark to me’’) with nine positively-worded items (i.e., ‘‘I look forward to the future with hope and optimism’’). With a true-false response format, the possible range of scores is from zero to 20.

Brooding rumination. Brooding, defined as the extent to which individuals passively focus on the reasons for their distress, was measured using the five items from the Response Styles Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991). In the present study, McDonald’s omega was .79 (Min = 5; Max = 20; *M* = 12.71; *SD* = 3.65).

Goal Disengagement. The goal adjustment scale (GAS; Wrosch, Scheier, & Miller et al., 2003) is a 10-item instrument that consists of two subscales: (i) goal disengagement (4 items) and, (ii) goal reengagement (6 items). Goal disengagement was used in the present study and measures one's perceived difficulty in reducing effort and relinquishing commitment toward unobtainable goals. In the present study, McDonald’s omega was .82 (Min = 4; Max = 20; *M* = 10.78; *SD* = 3.46).

Suicide ideation. The four-item Depressive Symptom Index – Suicidality Subscale (Joiner, Pfaff, & Acres, 2002) was used to identify the frequency and intensity of suicidal ideation and impulses in the past two weeks. Scores on each item range from 1 to 4, and on the overall questionnaire from 4–16, with higher scores reflecting greater severity of suicidal ideation. In the present study, McDonald’s omega was .91 (Min = 4; Max = 15; *M* = 5.15; *SD* = 2.05)

Suicide attempts. Suicide attempts were recorded if a respondent answered ‘yes’ to the following question: ‘Have you ever made an actual attempt to kill yourself in which you had at least some intent to die?’ In the present study 216 (17.6%) participants reported one or more suicide attempts.

Procedure

The research protocol was reviewed and approved by the institutional ethics panels of all three participating universities. Participants were recruited via an email invite to participate in a study of suicide. Within this email it was made clear to potential participants that they did not need to have experienced suicidal thoughts and behaviours to take part. Participants completed the study online using Qualtrics, a Web interface that allows for secure remote data collection through the distribution of anonymous secure links to the protocol. Participants were required to consent before the survey was presented online. Participation in the current study was voluntary and no inducements or obligations were used. All participants were debriefed and given phone numbers for local mental health services.

Analysis

The dimensionality of the BHS was investigated through the use of conventional confirmatory factor analytic (CFA) techniques, along with confirmatory bifactor modelling (see Reise, et al., 2010). Sixteen alternative models of the latent factor structure of the BHS were specified and estimated using Mplus version 6.12 (Muthén & Muthén, 1998 – 2010) with WLSMV estimation.

Model 1 is a one-factor solution in which all items of the BHS load onto a single latent variable of hopelessness. Model 2 is a correlated two-factor model (Nissim, Flora, & Cribbie et al., 2009). Model 3 is Rosenfeld et al.'s (2003) correlated three-factor model. Model 4 is Hill et al.'s (1988) correlated three-factor model. Model 5 is Dyce's (1996) correlated three-factor model. Model 6 is Beck's (1974) original conceptualization of the BHS. Model 7 is Innamorati et al.'s (2013) bifactor conceptualization. Models 8 to 11 are bifactor conceptualizations, each containing four latent variables: one general factor of hopelessness and three subordinate factors. The three sub factors are constructed based on the 3-factor models described above: Model 8 (Rosenfeld et al. 2004), Model 9 (Hill et al., 1988),

Model 10 (Dyce, 1996), and Model 11 (Beck et al., 1974). Models 12 to 16 are Multitrait–Multimethod models (also known as correlated trait/correlated method models). These models include two correlated method factors: a factor operationalised by all negatively phrased items and a factor operationalised by all positively phrased items, independent of whether the items belong to the 2 (negative expectations or loss of motivation) or 3 (variously labelled) hopelessness subscales. Each item, therefore, has two loadings: one on a hopelessness dimension and one on a method factor. The models are constructed based on conceptualizations described above: Model 12 (Nissim et al., 2009), Model 13 (Rosenfeld et al.'s 2004), Model 14 (Hill et al., 1988), Model 15 (Dyce, 1996), and Model 16 (Beck et al., 1974). Further details of factors (labels and items) are provided in Table S1 (online supplement).

The overall fit of each model and the relative fit between models were assessed using a range of goodness-of-fit statistics: the chi-square (χ^2) statistic, the Comparative Fit Index (CFI; Cronbach, 1990), and the Tucker Lewis Index (TLI; Tucker & Lewis, 1973). For CFI and TLI, values above 0.95 indicate good model fit (Bentler, 1990; Hu & Bentler, 1999). In addition, the root mean-square error of approximation (RMSEA: Steiger, 1990) with 90% confidence interval is presented. Ideally, this index should be less than 0.05 to suggest good fit (Bentler, 1990; Hu & Bentler, 1999). Furthermore, the BIC (Bayesian Information Criterion; Schwarz, 1978) was used to evaluate the alternative models, with the smaller value indicating the best fitting model.

Results

BHS scores ranged from zero to 20 (M = 6.78, SD = 4.92). Table 1 shows the fit indices of the 16 alternative models of the BHS. Models 1 to 11 were rejected based on RMSEA (above 0.05), CFI and TLI (less than 0.95) statistics. Models 12 to 16 were found to provide good representations, with Model 13 providing the best fit to the data (based on BIC). However,

the adequacy of a model should also be determined in relation to its parameter estimates. Although, the factors loadings were all in the expected direction, some of them were not statistically significant. The same problem was observed for Models 12, 14, and 15. Model 16 did not evidenced this problem (see Table 2), thus providing strong support for the supremacy of three BHS latent factors (based on Beck et al.'s original conceptualization) and the presence of two meaningful method effect factors. As there was no significant difference between the MTMM models tested (based on the Satorra-Bentler Scaled Chi-Square test) we propose the original conceptualization is the best solution with our data. McDonald's omega calculations indicated that factor 1 (0.91), factor 2 (0.91), and factor 3 (0.77) of the BHS possess satisfactory reliability.

Table 1 *Fit Indices for Sixteen Models of the BHS*

	χ^2	*df*	CFI	TLI	RMSEA (90% CI)	BIC
1. 1 factor	6015.53***	170	.82	.80	.138 (.135/.141)	35084.20
2. 2 Correlated factors	5782.08***	169	.83	.81	.135 (.133/.139)	32650.24
3. 3 correlated factors (Rosenfeld et al. 2004)	1987.83***	167	.94	.91	.085 (.082/.089)	29363.80
4. 3 correlated factors (Hill et al., 1988)	5051.16***	167	.85	.83	.127 (.124/.130)	30451.93
5. 3 correlated factors (Dyce, 1996)	4209.36***	167	.88	.86	.116 (.113/.119)	30166.42
6. 3 correlated factors (Beck et al., 1974)	5586.25***	167	.83	.81	.134 (.131/.137)	31679.75
7. Bifactor 2 factor (Innamorati et al., 2013)	3741.52***	150	.89	.86	.115 (.112/.118)	30305.54
8. Bifactor 3 (Rosenfeld et al. 2004)	3428.65***	151	.90	.87	.110 (.106/.113)	30823.72
9. Bifactor 3 (Hill et al., 1988)	3705.47***	150	.89	.86	.114 (.111/.118)	29848.79
10. Bifactor 3 (Dyce, 1996)	2552.16***	150	.93	.91	.094 (.091/.097)	29197.09
11. Bifactor 3 (Beck et al., 1974)	4658.11***	150	.86	.82	.130 (.126/.132)	30421.32
12. CFA-MTMM 2 factor	605.25***	148	.98	.98	.041 (.038/.045)	28851.96
13. CFA-MTMM 3 factors (Rosenfeld et al. 2004)	508.67***	146	.99	.99	.037 (.034/.041)	28673.58
14. CFA-MTMM 3 factors (Hill et al., 1988)	575.59***	146	.99	.98	.040 (.037/.044)	28684.39
15. CFA-MTMM 3 factors (Dyce, 1996)	513.97***	146	.99	.99	.037 (.034/.041)	28674.52
16. CFA-MTMM 3 factors (Beck et al., 1974)	589.81***	146	.99	.98	.040 (.037/.044)	28699.03

Note. χ^2 = chi square goodness of fit statistic; *df* = degrees of freedom; RMSEA = Root-Mean-Square Error of Approximation; CI = Confidence Interval; BIC = Bayesian Information Criterion; CFI = Comparative Fit Index; TLI = Tucker Lewis Index. *** Indicates χ^2 is statistically significant ($p < .001$).

Table 2. *Standardized Factor Loadings for the three Hopelessness Factors (Factor 1 = Feelings about the Future, Factor 2 = Loss of Motivation, Factor 3 = Future Expectations) and Two Method Factors (Negative and Positive) of the BHS.*

Original item numbers and abbreviated content	Method 1 (negative)	Method 2 (positive)	Factor 1	Factor 2	Factor 3
1. Look forward to the future with hope		.36**	.88***		
2. Might as well give up	.32***			.76***	
3. Helped knowing can't stay that way		.45***		.76***	
4. Can't imagine life in 10 years	.46***				.51***
5. Have enough time to accomplish things		.25**	.66***		
6. Expect to succeed		.34**	.83***		
7. Future seems dark	.44***				.80***
8. Expect to get more good things		.20*			.60***
9. Just don't get the breaks	.47***			.64***	
10. Experiences prepared well for future		.39***			.68***
11. Ahead of me is unpleasantness	.36***			.83***	
12. Don't expect to get what I really want.	.60***			.61***	
13. Expect to be happier than now		.41***	.65***		
14. Things won't work out	.58***				.66***
15. Have great faith in the future		.23*	.88***		
16. Never get what I want	.50***			.74***	
17. Very unlikely to get real satisfaction	.41***			.81***	
18. Future seems vague and uncertain	.69***				.51***
19. Look forward to more good times		.34**	.86***		
20. No use in really trying	.46***			.78***	

Note. Factor loadings are statistically significant at * $p < .05$; ** $p < .01$; *** $p < .001$

The three general factors were weakly to strongly correlated: Factor 1 (feelings about the future) with Factor 2 (loss of motivation) ($r = 0.46$); Factor 1 with Factor 3 (future expectations) ($r = 0.26$); and Factor 2 with Factor 3 ($r = 0.66$). Further regression analyses (logistic for suicide attempts and linear for the other outcome variables) examined the relationships between the BHS subscale scores and external variables (Table 3) due to the high correlation between factors 2 and 3. Results indicate that factor 1 and 2 but not factors 3 are significantly associated with suicide attempts and ideation. Factors 2 and 3 but not 1 were significantly associated with brooding rumination. Finally, factor 3, but not the other 2 factors, was significantly associated with goal disengagement. These results suggest that these factors have differential predictive validity.

Table 3

Associations between the three BHS factors and external variables

Variable	Suicide Attempt OR (95% CI)	Suicide Ideation β (95% CI)	Rumination β (95% CI)	Goal Disengagement β (95% CI)
Factor 1 (Feelings about the Future)	1.16** (1.04/1.30)	.33*** (.25/.41)	.02 (-.05/.10)	.05 (-.04/.14)
Factor 2 (Loss of Motivation)	1.17*** (1.06/1.28)	.29*** (.22/.35)	.22*** (.17/.29)	.05 (-.02/.13)
Factor 3 (Future Expectations)	1.09 (.96/1.24)	.06 (-.01/.12)	.33*** (.26/.38)	.11** (.04/.18)

Note. Suicide attempts: Cox & Snell $R^2 = .07$, Nagelkerke $R^2 = .12$; Suicide Ideation $R^2 = .41$; Rumination $R^2 = .33$; Goal Disengagement $R^2 = .05$. $^{**}p < .01$, $^{***}p < .001$

Discussion

This study tested a series of alternative models of the BHS, using data drawn from a large non-clinical sample. Including all 20 items, a three-trait two-method model, based on Beck et

al.'s (1974) original 3-factor conceptualisation, was considered the best solution with our data. This factorial solution suggests the use of both positively and negatively worded items in the BHS results in the occurrence of unwanted method effects, which may have previously lead to an artificial increase or decrease in the covariation among observable indicators (Bagozzi, 1993).

As far we know this is the first study which investigated the fit of a three-factor model of the BHS while assessing the role of possible artefacts due to the wording of items, although a two-dimensional model of optimism and pessimism has been suggested in the past. Chang et al. (1994), for example, pointed out that labels assigned by Beck et al. (1974) to the factors did not adequately summarize the content of the items, the first factor actually representing a measure of optimism. Thus, our incorporation of method effects in the structure of the BHS consolidates previous findings, where either one-factor solutions were reported (Young et al., 1992), or positively and negatively worded items were found to load onto separate factors (e.g., Hill et al., 1988; Rosenfeld, et al., 2004).

In addition to providing an explanation for previous conflicting results and a clearer delineation of hopelessness as a multidimensional construct, modelling both content and method-related factors has allowed for a more precise assessment of the reliability of BHS scores. Our results indicate that the BHS item scores possess satisfactory reliability. Item 10 ("My experiences prepared me well for future"), for instance, was found to be a weak (low factor loading) item in some research (Beck et al., 1974; Steer et al.,1994; Szabo et a., 2015). However, in the present study, the loading was 0.64. Moreover, all items displayed factor loading above 0.5, suggesting that all 20 items contribute substantially to the conceptualisation of hopelessness. Consequently, it is possible to retain all items of the scale for both clinical and research purposes. This is important as models that do not retain the full 20 items (e.g., Hanna et al., 2011) suffer from poor reliability.

The importance of retaining three distinct hopelessness factors in research and clinical practice was further supported by our examination of the differential predictive validity of these factors. Whilst previous research (e.g., Rosenfeld et al., 2004) that has retained three factors has found similar correlations for all three components, we found that the three factors were differentially associated to important suicide-related constructs namely goal disengagement, brooding rumination, suicide ideation, and suicide attempts. Thus, clinically, combining components into a composite variable might weaken the predictive value of the total score if it contains non-predictive sub-scores.

The findings reported here need to be considered within the context of an important limitation: although this was a non-clinical sample, it consisted entirely of university students. This prevents generalisation to the population as a whole, as well as other specific populations (e.g., clinical and forensic); thus further work from a broader range of backgrounds is required to confirm the findings of this study; one solution that fits all populations may not exist. Nevertheless, we investigated the factor structure of BHS scores with sound methods and compared different factor models previously reported in the literature, together with the 3-factor solution with 2 method effects (i.e**.,** a multitrait–multimethod model). Given the size of the sample used in this study, and the considerable variance in BHS scores within the sample, one can be relatively confident that the results are stable. However, it is important to note that the data reported here were part of a larger study of suicidal thoughts and behaviour, and the mean and standard deviation for the BHS is much higher than in previous student-based research (e.g., Troister, D'Agata, & Holden, 2015). Finally, as there were no validity checks in place within the online survey, it is not possible to rule out the possibility of careless or inconsistent responding.

Despite these potential limitations, our study is the first to use MTMM methods in a large non-clinical sample to reconcile previously inconsistent results concerning the

underlying structure of BHS items scores. Although Steed (2001) concluded that BHS might be uninterpretable in "normal populations", the results of the present study do not support this assertion. Instead, the results of the present study suggest that achieving a clear and valid interpretation of BHS scores in students or other healthy populations may require method effects to be controlled for.

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Table S1

Fit indices for the alternative confirmatory factor analysis models tested in the literature with information on the original samples and methods of analysis

Authors	**Number of factors and items**	**Factor composition**	**Sample**	**Method of testing/initial extraction**	**Fit indices**	***M* and SD**	**Reliability**
Medonca et al. (1983)	1 20 items	N/A	78 psychiatric Canadian patients; 65% displaying suicidal behaviour[b]	PCA, orthogonal rotation; and parallel analysis	χ^2 (170) = 242.97, p < .001, EVCI = .56 (90% CI .49/.63), RMSEA = .03	Controls M = 7.15 (SD = 4.55) Ideators M = 11.29 (SD = 5.58) Attempters M = 10.20 (SD = 6.34)	α = .91
Nekanda-Trepka et al. (1983)	5 20 items	F1 (Motivation and outcome expectation): 2, 9, 11, 12, 16, 17, 20; F2 (Confidence in the future): 1, 10, 13-15; F3 (Future accomplishment): 5-7; F4 (Trust in the future): 3, 8, 19; F5 (Time perspective): 4, 18.	[b]86 patients with depression	PCA, varimax rotation	Not reported	M = 13.05, SD = 5.17	Not reported
Ward & Thomas (1985)	1 20 items [c]	N/A	197 University students	PCA, oblique rotation	Not reported	Not reported	Not reported
Chang et al. (1994)	1 20 items	N/A	389 US UG psychology students	Unweighted least squares, oblique; CFA based on all positively and negatively phased items	χ^2 (169) = 147.90, p = .88, GFI = .98	Not reported	α = .85

Young et al. (1992)	1 20 items	N/A	Sample 1: 730 US psychiatric patients. Sample 2: 257 mixture of US patients and students	Two-parameter maximum likelihood item-response model	Sample 1: $\chi^2(19)$ = 193.60, p <.005, GFI = .98 Sample 2: $\chi^2(19)$ = 125.8, p <.005, GFI = .98	Sample 1: M = 6.28 (SD = 5.52) Sample 2: M = 7.00 (SD = 5.80	α = .92
Mystakidou et al. (2008)	1 12 items	1, 3, 7, 9, 11–15, 17–19	112 Greek cancer patients	PCA with varimax rotation & Kaiser-Guttman criterion	Not reported	Not reported	α. = 94
Aish & Wasserman (2001)	1 4 items	6, 7, 9, 15	324 Swedish suicide attempters	Weighted Least Squares CFA	χ^2 (2) = 1.02, p = .60, RMSEA = .069	Not reported	Not reported
Hanna et al. (2011)	1 4 items	6, 7, 9, 15	581 UK undergraduate students	Diagonally Weighted Least Squares (DWLS) CFA	χ^2 (2) = 0.75; p = .69; RMSEA < .001	Not reported	KR of .50
Innamorati et al. (2013)	1 construct and 2 method factors – Bifactor 20 items	F1 (Pessimism): 2, 11, 16, 17, 20; F2 (Optimism): 1, 3, 5, 6, 8, 10, 13, 15, 19	514 Italian medical patients	Diagonally Weighted Least Squares (DWLS) CFA	χ^2 (150) = 273.39, p < .001, NFI = .98, NNFI = .99, CFI = .99, RMEA .04 (90% CI .03/.05), SRMR = .06	M = 6.39 (SD = 4.68) on the general factor, and means of 1.08 (SD = 1.56) and 3.23 (SD = 2.75), respectively, for the pessimism and the optimism factors	F1 KR-20 of .81 F2 KR-20 of .82 General factor KR-20 of .82 KR-20 of .87 (.86 when including also item #8)
Szabó et al. (2015)	1 construct	F1 (Feelings about the Future): 1, 6, 13, 15, 19; F2	905 clinic-referred	CFA with WLSMV estimator, EFA	*CFA* χ^2 = 186.912, p < .05, CFI = .99,	M = 8.13 (SD = 5.13, N = 844)	α = .90 total sample

	and 2 method factors – bifactor 18 items	(Loss of Motivation): 2, 3, 9, 11, 12, 16, 17, 20; F3 (Future Expectations): 4, 7, 8, 14, 18	individuals	with oblimin rotation	TLI = .99, WRMR = .81, RMSEA = .036		Coefficient omega = .89
Illiceto et al. (2013)	Single second-order factor (three first-order factors) 20 items[c]	F1 (Motivational): 1, 5, 6, 13, 15, 19; F2 (Affective): 2, 3, 9, 11, 12, 16, 17, 20; F3 (Cognitive): 4, 7, 8, 10, 14, 18. Correlations .28-.35	509 Italian community adults – sample split randomly into 2	CFA and maximum likelihood estimation	Sample 1 χ^2 (167) = 292.07, $p < .001$, CFI = .96, TLI =.95, RMSEA = .05, SRMR = .04 Sample 2 χ^2 (167) = 383.26, $p < .001$, CFI = .94, TLI = .93, RMSEA = .07, SRMR = .04	Not reported	Not reported
Bouvard et al. (1992)	2 20 items	F1: 1, 3, 6-8, 11-15, 18, 19; F2: 2, 4, 5, 9, 10, 16, 17, 20	100 French patients with depression 93 control group	PCA with varimax rotation	Not reported	Not reported	α = .97 depression group α = .79 control group
Steed (2001)	2 16 items	F1: 1, 3, 6, 7, 10, 11, 15, 18, 19; F2: 2, 9, 12, 14, 16, 17, 20[d] Correlation: .95	544 US undergraduate students	Scree test & Kaiser-Guttman criterion. Principal-axis EFA with oblique rotation and CFA	χ^2 (103) = 360.05, $p < .05$, AGFI = .90, CFI = .94, RMSEA = .06	*M* = 42.62, *SD* = 9.85	α = .88 With removal of Items 4, 5, 8, and 13, was α = .89
Nissim et al. (2009)	2 20 items	F1 (Negative expectations): 1, 2, 3, 5, 6, 7, 13, 15, 18, 19;	406 Canadian patients with	Scree test. Robust-weighted least-squares EFA (*N* =	EFA: RMSEA = .03	*M* = 5.3 (*SD* = 4.7)	α = .86 for the first factor and α

		F2 (Loss of motivation): 4, 8, 9, 10, 11, 12, 14, 16, 17, 20 Correlation: .69	advanced cancer	170) with oblique rotation & CFA (N = 171)	CFA: χ^2 (169) = 240.33, p < .001, TLI = .99, CFI = .99, WRMR = .85, RMSEA = .06		= .83 for the second factor
Pompili et al. (2007)	2 11 items	F1: 11, 16, 17, 19, 29; F2: 1, 7, 12, 14, 15, 18 Correlation: .52	340 Italian university students	Scree test & Kaiser–Guttman criterion. EFA with oblique rotation	Not reported	Not reported	Not reported
Tanaka et al. (1998)	2 18 items[c]	F1 (Doubt about a hopeful future): 1, 4, 5, 6, 8, 12, 13, 14, 15, 18; F2 (Belied about a hopeless future): 2, 7, 9, 10, 11, 16, 19, 20 Correlation: .90	154 Japanese community sample	Scree test & Kaiser–Guttman criterion. PCA with oblique rotation	Not reported	M = 8.6 (SD = 3.9)	Not reported
Marshall et al. (1992)	2 18 items[c]	F1 (Optimism): 4, 7, 9, 12, 14, 16, 17, 18; F2 (Pessimism): 1, 3, 6, 8, 13, 15, 19 Correlation: .79 and .77, for Samples 1 and 2, respectively.	2 samples (346 & 543) of male US navy recruits	Scree test & Kaiser–Guttman criterion. Principal-axis- EFA with varimax rotation & CFA estimator not provided	Sample 1: χ^2 (89) = 230.86, p < .001, CFI = .88 Sample 2: χ^2 (89) = 210.82, p < .001, CFI = .89	Sample1: M = 5.23 (SD = .99) Sample 2: M = 5.24 (SD = .69)	Both subscales α = .82 for combined sample
Zhang et al. (2015)	4 (suicide attempters), 5 (controls) 20 items[c]	Four-factor model. F1 (Loss of motivation): 1, 2, 7, 9, 11-20; F2 (Positive expectation): 5, 6, 8; F3 (Negative expectation): 3, 10; F4: (Future expectation): 4 Five-factor model. F1 (feelings about the future): 1, 7, 13, 15, 19; F2 (Pessimistic	401 Chinese Suicide attempters from general hospitals and 409 matched controls	CFA, estimator not provided	Suicide attempters: χ^2 (169) = 719.87, p <.001, CFI = .91, GFI = .83, RMSEA = .09 Controls: χ^2 (169) = 464.17, p <.001, .07, CFI = .90, GFI = .90, RMSEA =	57.53 (SD = 21.12) in suicide attempters and 32.43 (SD = 10.17) in controls	α = .94 and α = .89 for suicide attempters and controls, respectively

		motivation): 11, 12, 14, 16-18, 20; F3 (Positive expectation): 5, 6, 8, 10; F4 (Negative expectation): 2, 3, 9; F5 (future expectation): 4					
Beck et al. (1974)	3 18 items	F1 (Feelings about the Future): 1, 6, 13, 15, 19; F2 (Loss of Motivation); 2, 3, 9, 11, 12, 16, 17, 20; F3 (Future Expectations); 4, 7, 8, 14, 18 Factors largely defined by positive and negatively phrased items. Treat as unidimensional recommendation. Correlations: .88-.92	294 US suicide attempters	Kaiser–Guttman criterion. PCA with varimax rotation.	χ^2 (132) = 189.08, p < .001, EVCI = .46 (90% CI .40/.53), RMSEA = .03	Not reported	α = .93
Rosenfeld et al. (2004)	3 20 items	F1: 1, 5, 6, 8, 10, 13, 15, 19; F2: 2, 9, 16, 17, 20; F3: 4, 7, 11, 12, 14, 18 Correlations: .87-.90	2 samples of US AIDS patients; n = 479, n = 198	CFA, estimator not provided	χ^2 (149) = 224.37, p < .001, EVCI = .53 (90% CI .46/.60), RMSEA = .03	Not reported	Not reported
Dyce (1996)	3 20 items	F1 (Expectations of Success): 1, 2, 3, 5, 6, 10, 13, 15, 19; F2 (Expectations of failure): 9, 11, 16, 17, 20; F3 (Future Uncertainty): 4, 7, 8, 12, 14, 18 Treat as three-or one-dimensional recommendation Correlations: .88-.92	411 Canadian outpatients	Kaiser–Guttman criterion. PCA with varimax rotation	χ^2 (167) = 209.32, p = .015, EVCI = .51 (90% CI .45/.58), RMSEA = .02	M = 8.36, SD = 5.68	α = .92

Steer et al. (1993)	3 20 items	F1 (Rejection of the possibility of a hopeful future): 2, 9, 11, 16, 17, 20; F2 (Acceptance of the inevitability of a hopeless future): 1, 6, 8, 13, 15, 19; F3 (Resignation to the futility of changing the future): 4, 14 Correlations: .87-.92	108 adolescent inpatients	Kaiser–Guttman criterion. PCA with varimax rotation[a]	Not reported.	*M* = 6.94 (*SD* = 4.85)	KR-20 estimate of internal consistency was .86
Hill et al. (1988)	3 20 items	F1: 1, 3, 5, 6, 13, 15, 19; F2: 2, 8, 9, 11, 16, 17, 20 F3: 4, 7, 10, 12, 14, 18 Correlations: .86-.89	120 US depressed elderly outpatients	PCA with varimax rotation[a]	χ^2 (167) = 208.93, *p* = .021, EVCI = .51 (90% CI .45/.58), RMSEA = .02	*M* = 5.87 in subjects 65 years and older *M* = 3.36 in subjects under 24 years	α = .84

Note: [a] Method of extraction not specified, [b] findings are questionable due to small sample size, [c] results from this study are not directly comparable to other studies as the response format was altered (i.e., from true-false to a 5-choice scale) d factor structure described as of "questionable interpretability". KR = Kuder–Richardson reliability.