A Turkish Translation of a Measure of Irrational and Rational Beliefs: Reliability, Validity Studies and Confirmation of the Four Cognitive Processes Model

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Abstract

This study adapted the Attitudes and Belief Scale-2 (ABS-2) into Turkish and investigated its factor structure, criterion-related validity, and psychometric properties. The ABS-2 assesses REBT's irrational and rational beliefs. Each item reflects one of the four cognitive processes thought identified the theory to reflect irrationality or rationality. These include demandingness versus preferences, awfulizing versus realistic negative evaluations, frustration intolerance versus tolerance, and self-condemnation versus self-acceptance. Each item reflects one of three content areas of achievement, affiliation, or comfort. Despite the ABS-2's good validity, researchers have criticized its factor structure. This weak support questions REBT's theoretical assumptions. This article includes four studies that describe the translation into Turkish and comparability of the two versions, the test–retest reliability, exploratory and confirmatory factor analysis, and criterion-related validity. The four samples consisted of 811 participants. A two-factor structure (one representing rational items and another consists irrational beliefs items) was supported by confirmatory factor analysis. Criterion-related validity analysis was supported as the ABS-2 correlated positively with the Jones' Irrational Beliefs Test, anxiety and depression dimensions of brief symptom inventory, and the need for absolute truth. The research supported the four cognitive process model.

Keywords Irrational beliefs · Rational beliefs · REBT · Attitudes and Beliefs Scale-2 · TABS · Turkish language

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Introduction

'Men are disturbed not by things, but by the view which they take of them.' (Epictetus 1996; 55–135 C.E.). Albert Ellis was influenced by this quote when he created the ABC model in his Rational Emotive Behavior Therapy (REBT: Ellis 1994; Ellis and Dryden 1997), which was the first model of Cognitive Behavior Therapy (CBT). Ellis proposed the ABC model to help clients' understand the role of thoughts on their emotional and behavioral disturbance: 'A' stands for activating event, 'B' for irrational beliefs (IBs) or rational beliefs (RBs), 'C' for the emotional or behavioral consequences. In the model, the B–C connection is the most important part of emotional disturbances. It is not the As (events or situations) only that cause disturbance, but the interaction of the As and IBs that play the most crucial role in clinical disorders (Ellis 1994). Within the CBT model, IBs and RBs represent a person's underlying schemas and the evaluative and imperative nature of personal schema. In REBT, IBs and their rational counterparts are theorized to fall into four categories: (1) irrational demandingness versus rational non-demanding preferences, (2) irrational catastrophizing/awfulizing versus rational realistic negative evaluations, (3) irrational frustration intolerance versus rational frustration tolerance, and (4) irrational global condemnation of human worth (self/others/life downing) versus rational self and other acceptance (Ellis 1994; DiGiuseppe et al. 2014).

REBT theory considers Demandingness as the primary irrational belief (Dolliver 1977; Prud'homme and Baron 1988; DiGiuseppe et al. 2014; Ellis and Dryden 1997). The three other evaluative beliefs are generated by demandingness and together they elicit dysfunctional emotions and psychological disorders (DiGiuseppe et al. 2014; Ellis and Dryden 1997, 2003; David et al. 2010). In the REBT model, IBs arouse unhealthy, disturbed, negative emotions such as anger, anxiety, shame, and depression (Collard and O'Kelly 2011; Ellis and Dryden 1997). These emotions subsequently represent mental disorders. Examples of irrational beliefs are: 'I must do well at important things, and "I will not accept not doing well.' RBs elicit negative, but healthy and functional emotions (DiGiuseppe et al. 2014; Ellis and Dryden 1997; Ellis 2003; David et al. 2010). Examples of rational beliefs include: 'It is disappointing to be disliked by people who are important to me, but it is only disappointing and not awful.' 'I have worth as a person even if I do not perform well at important tasks.' These alternative RBs are likely to lead to coping, problem solving, and eventually to better adjustment (Artiran 2015; DiGiuseppe et al. 2014; Ellis 1994, 2003).

Many schools of psychotherapy have been introduced to the world by western culture. Each psychotherapy has hypothetical constructs, hypotheses, and assumptions about human nature. However, these models might not necessarily explain human behavior in different non-western cultures. To assess whether the various psychotherapy paradigms apply to people in non-western cultures, one must first translate the measures that assess a theory's core constructs into the languages of other cultures. Irrational belief scales have appeared to assess the fundamental cognitive processes hypothesized by REBT theory to lead to disturbance and

adaptation. However, most of these tests reflects a primarily English speaking cultural perspective (DiGiuseppe et al. 2018). Without valid instruments for surveying IBs and rational beliefs (RBs) in different cultures, disconfirmation or corroboration of the theory is impossible. This research attempted to further this task by adopting a measure of IBs and RBs into Turkish to provide evidence concerning the underlying factor structure, reliability and validity of a measure of IBs and RBs in Turkey.

Although a number of IB inventories exist, some have been criticized one some basic criteria. Some instruments have confounded items by including items that measure behaviors and emotions as well as items assessing cognitions. Thus, any correlation of such scales with measures of emotional and behavioral disturbance will be inflated because of this confounding. Some REBT scales included items that assess other constructs form other variants of CBT such automatic thoughts or cognitive errors that reflect Beck (1976) model of cognitive therapy. Such measures can be used to test the general theories of CBT but not test the specific hypotheses that follow form REBT. Additionally, some scales in REBT measure only IBs and not RBs (Terjesen et al. 2009).

The Attitudes and Beliefs Scale-2, (ABS-2: DiGiuseppe et al. 2018) was designed to avoid the above criticism and therefore has advantages over other REBT instruments (Terjesen et al. 2009). The ABS-2 measures Ellis' IBs and RBs (Ellis and Dryden 1997) and uses a self-report, Likert format. DiGiuseppe et al. (1989) were inspired by Campbell (1985) and Burgess' (1989, 1990) original ABS measure when they wrote their items.

The ABS-2 has 72 items that comprise a $2 \times 4 \times 3$ matrix. The first factor is irrationality versus rationality. The second factor included cognitive process that has four levels representing the irrational and rational belief processes of demandingness versus non-demanding preferences, self-condemnation versus self-acceptance, frustration intolerance versus frustration tolerance, and awfulizing versus realistic negative evaluations. The third factor includes different contents or context areas about which the beliefs refer. It consists of three levels: beliefs about affiliation, achievement, and comfort. Table 1 presents the factor structure of the ABS-2. The utility of the ABS-2 for both researchers and clinicians comes from the proposed capacity to yield scores for each of the rational or irrational belief processes; as well as scores for both Irrationality and Rationality (Hyland 2014).

DiGiuseppe et al. (2018) described the psychometric properties of the instrument and demonstrated that it has good internal reliability and validity. However, they did an inadequate job of assessing its factor structure. Two articles unsuccessful attempted to us use confirmatory factor analyses to corroborate the complex structure of the ABS-2 (Fülöp 2007; Hyland et al. 2014). It is uncertain whether these failures to confirm the model reflects a problem with the four cognitive processes model of REBT, or with the ABS-2. Despite the frequent use of this measure in the REBT research, the absence of support regarding the factor structure of the scale means that appropriate scoring is problematic (Hyland et al. 2017).

Recently, DiGiuseppe et al. (2020) tested many CFA models that could explain the structure of the ABS-2. They failed to confirm the original structure and found that the models with the best fit separated irrational and rational items

Table 1 Exploratory factor analysis results using a principal axis factoring extraction method and an oblimin rotation

Pattern matrix	Factor 1	Factor 2
ABS31	.719	
ABS29	.711	
ABS48	.705	
ABS41	.702	
ABS21	.701	
ABS20	.697	
ABS72	.688	
ABS73	.685	
ABS76	.683	
ABS32	.683	
ABS35	.673	
ABS69	.652	
ABS55	.649	− .102
ABS54	.645	
ABS25	.644	
ABS57	.635	
ABS58	.631	
ABS19	.620	
ABS30	.616	
ABS70	.607	
ABS45	.602	
ABS17	.599	
ABS46	.591	
ABS24	.588	
ABS44	.583	
ABS14	.579	
ABS40	.556	− .105
ABS61	.539	
ABS13	.515	
ABS11	.494	
ABS51	.463	
ABS62	− .331	.328
ABS16	.299	
ABS38	.296	.200
ABS7	.248	
ABS64	.233	
ABS39		.697
ABS67		.678
ABS63		.675
ABS37		.655
ABS74		.650
ABS52		.641
ABS65	− .116	.630

Table 1 (continued)

Pattern matrix	Factor 1	Factor 2
ABS18		.622
ABS50		.615
ABS53		.609
ABS28		.598
ABS26		.596
ABS42		.564
ABS60		.563
ABS23		.554
ABS27	− .115	.547
ABS68		.544
ABS59		.530
ABS12		.524
ABS66		.522
ABS75		.519
ABS56		.502
ABS9		.494
ABS22		.485
ABS6	− .160	.461
ABS49		.452
ABS47		.451
ABS10		.446
ABS34	.109	.425
ABS33	.130	.404
ABS71		.389
ABS8		.386
ABS15		.370
ABS5		.294
ABS43	− .107	.255
ABS36		.174

Factor 1: rational beliefs, Factor 2: irrational beliefs. Factor load values below 10 were not reported

into separate scales and that the items formed factors more on the bases of the three content areas than the cognitive processes.

Because the ABS-2 still represents the most comprehensive, reliable, and valid measure of IBs and RBs, and it avoids the problem of confound cognitions with emotions and behaviors, and it avoids included items that reflect other CBT constructs and only measures REBT constructs, we chose it as the instrument to use in testing REBT hypotheses in Turkish culture. This study reports on a Turkish version of the ABS-2, and its reliability, factor structure, and validity.

Study I: Translating the ABS-2 into Turkish

The first step in this study was translating the ABS-2 from English to Turkish and determining that the scale scores in both languages correlated with each other. This required bilingual scholars to translate the items, and administering both the English and Turkish versions of the scale to participants in the same sample to determine if the two versions measured IBs and RBs similarly in both languages.

Participants

Two academic scholars who specialized in the English and Turkish languages were recruited from the University's Applied English and Translation Programme. Also, we recruited two additional scholars who used both languages in different tasks such as lectures and research in a University in Istanbul. These scholars translated the ABS-2 into the Turkish ABS (TABS). Also, 50 university students (26 women, 24 men) were recruited randomly from an English-Language Studies courses at a Turkish university (average age = 25.1; SD = 2.91) to complete the scales in both languages.

Procedures

The Turkish translation of the English version was conducted in three stages. First, the four academics specializing in English and Turkish language independently translated the 72 items into Turkish. Then the two versions were compared, and the translators discussed differences. Eventually, the translators reached a consensus on one final version. A separate, certified English-Turkish translator then translated the scale back into English. Second, we administered the Turkish version to 40 Turkish university students to receive feedback on the readability of items. Based on this feedback, some changes were made to the items to make them clearer. Third, we administer the TABS to 50 Turkish university fourth-year students who studied English, 3 weeks later we administered the original English version to the same students (26 women, and 24 men; $Mean =$: 25.1; $SD = 2.91$). Instructions were given orally and in writing to the participants. An inform consent form was completed for all participants for both administrations. The TABS took an average of 25 min to complete. Spearman's rank order correlations indicated that the Turkish and English versions of the scale were highly correlated. The correlation coefficient for irrational beliefs items was $r = .85$ ($p < .001$), and $r = .74$ ($p < .001$) for the RB items.

Study II: Test–Re-Test Reliability

Participants and Procedure

This sample consisted of 34 volunteer participants who lived in the Turkish province of Istanbul. The data were collected with the random sampling method. These participants ranged in age from 18 to 54 years; there were 15 females (44.1%) 19 males (55.9%). The mean age is 35.38 with a standard deviation of 11.43. Data were collected a twice 2 weeks apart. Eight of the 42 participants in the first administration were not able to complete the time 2 admiration for various reasons. In both data collections. The instructions were given to participants verbally. They completed the questionnaire in 25 min. We used the SPSS 20.0 program to analyses all data.

Results

The results revealed that test–retest reliability for IB subscale of the TABS was $r = 0.91$ ($p < 0.01$), and $r = 0.86$ ($p < 0.01$) for the TABS RB subscale. For the total score the test–retest reliability was $r = 0.89$ ($p < 0.01$). For the contents domain subscales of TABS test–retest reliability values were for content of achievement $r = 0.83$, affiliation $r = 0.66$, and comfort $r = 0.90$.

We also tested the internal consistency the TABS using Cronbach's Alpha coefficient before doing exploratory factor analysis (EFA). The internal consistency is over .90 and considered excellent for a scale (McMillan and Schumacher 2001). For TABS, the value was $\alpha = .91$, for total the IB items was $\alpha = 0.92$, and $\alpha = 0.94$ for the RB items. For content of achievement Cronbach's $\alpha = 0.83$, affiliation $\alpha = 0.66$, and comfort $\alpha = 0.90$.

Study III: Explanatory Factor Analysis

Data Analysis

Given that several researchers have failed to find support for the 8-factor model proposed for the ABS-2, it was appropriate to do an EFA to determine what the factor structure of the TABS would be. All data were analyzed using SPSS 20.0 software.

### Participants, Instruments, and Procedures

A sample of 314 participants was used for the EFA. The sample included 142 females (45.2%) and 172 male (54.8%) who ranged in age from 18 and 32 with a mean age of 25.6 and a standard deviation of 3.42. Participants were conveniently selected (and volunteered) from three Turkish cities, İstanbul, Bursa, and Ankara. They were primary/secondary schoolteachers, company employees, university students, and some bank branch employees these cities. At this stage, the participants completed only the TABS.

Results

The results of the *KMO* (Kaiser–Meyer–Olkin) coefficient (.858) and the Bartlett Sphericity Test (10,687.5) and Chi square statistic were significant ($p < 0.05$), and were determined to be suitable for the EFA (Kalaycı 2005). We employed the principal axis factoring extraction method and direct oblimin rotation.

When we entered the 72 items into the analysis, 16 factors with eigenvalues greater than 1.0 emerged and explained 65.66% of the variance. An examination of the scree plot, which appears in Fig. 1, revealed that although 16 factors emerged with the eigenvalues greater than 1, these eigenvalues were small seems an close to each other, so we chose to rely on the scree plot to determine the number of factor (Rietveld and Van Hout 1993). We looked for the number of factors where the line stops descending precipitously and levels out (Bryant and Yarnold 1995). We decided that a two-factor solution best fit the line. The two factors describe 32.7% of the total structure. The first factor describes 18.9% of the variance and the second factor accounts for 13.8%.

The item loadings of 55 items of the TABS (except 17 items) loaded above 0.30 and 0.40. Büyüköztürk (2009) stated that the item-total correlation should be at least .30, whereas Bryman and Cramer (2001) and Field (2005) suggest that items lower than 0.30 should be removed, and argued that factor loading values for scale items are acceptable if they are over 0.30 or 0.40. When the EFA analysis was redone seeking a two factors solution, the item loadings supported a 2-factors model except item number 62. These results appear in Table 1.
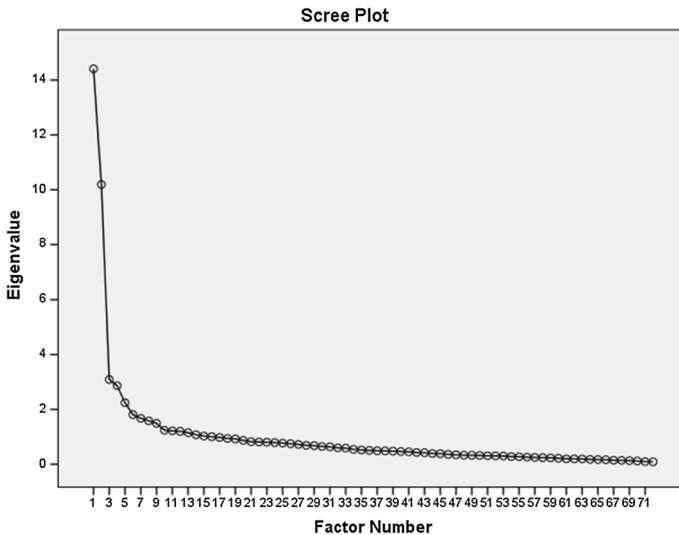
Fig. 1 Scree plot chart for exploratory factor analysis of all 72 items of the TABS

Study IV: Confirmatory Factor Analysis

Given the complex model of the ABS-2 and the TABS, we tested multiple CFA models in LISREL 8.80 (Diamantopoulos and Siguaw 2000) and compared them against each other.

Participants

The sample consisted of 274 participants, 52.2% were women. We selected by with random sampling method from Istanbul city. This participants age range was from 20 to 49 years, with a mean of 24.4 (SD = 5.56). Two hundred and thirty-seven (87.5%) of the participants had never received any psychological treatment, while 37 (13.5%) respondents stated that they had received psychological treatment in the past.

Measures

The demographic information form and the TABS were used at this stage. Informed consent forms and the purpose of the research were explained to the participants orally and in writing before the administration.

Procedure

CFA is used in the confirmation of the structure of measurement instruments to tests and supports how many variables are generated by the actual data (Sümer 2000). The ABS-2 had received criticism due to uncertainty about the factor structure; it might be challenging to attain confirmation of its factor structure given the complexity of its items and subscales, and the number of items (Hyland 2014). When the dimensionality of the items of a measure is unclear, parceling can be used (Little et al. 2002). Item parceling allows researchers to reduce the number of dimensions and number of parameters estimated, which consequently produces more stable parameter estimates and more appropriate solutions for model fit (Bagozzi and Heatherton 1994; Bagozzi and Edwards 1998; Bandalos and Finney 2001). Because of the large number of items and dimension, we chose to use several parceling methods to tests the TABS factor structure.

Creating Parcels

In creating parcels, we used the systematically distributed parceling strategies (SDPS). SDPS count the sum of scores of parcel scores instead of the individual item themselves in the SEM analysis (Bandalos 2008; Little et al. 2002). First, we recoded the rationally worded items so that rationally worded and irrationally worded items would have higher scores for irrationality and less rationality. To help understand the parceling process, readers can consult Tables 2 and

Table 2 Model of irrational and rational belief processes by belief content used to construct the ABS–2 and the Turkish Attitudes and Beliefs Scale (TABS), cell number, and the number of items per cell

	Demandingness	Frustration intolerance	Awfulizing	Self-ratings
Belief content				
Affiliation	Cell 1 Demanding about affiliation—3-items	Cell 2 FI about affiliation—3-items	Cell 3 Awfulizing about affiliation—3-items	Cell 4 Self- condemning about affiliation—3-items
Achievement	Cell 5 Demanding about achievement—3-items	Cell 6 FI about achievement—3-items	Cell 7 Awfulizing about achievement—3-items	Cell 8 Self- condemning about achievement—3-items
Comfort	Cell 9 Demanding about comfort—3-items	Cell 10 FI about comfort—3-items	Cell 11 Awfulizing about comfort—3-items	Cell 12 Self-condemning about comfort—3-items
Rational belief processes				
	Non-demanding preference	Frustration tolerance	Realistic non-awfulizing evaluations	Self-acceptance
Belief content				
Affiliation	Cell 13 Non-demanding preference about affiliation—3-items	Cell 14 FT about affiliation—3-items	Cell 15 Realistic negative evaluation about affiliation—3-items	Cell 16 Self-acceptance about affiliation—3-items
Achievement	Cell 17 Non-demanding preference about achievement—3-items	Cell 18 FT about achievement—3-items	Cell 19. Realistic negative evaluation about achievement—3-items	Cell 20 Self-acceptance about achievement—3-items
Comfort	Cell 21 Non-demanding preference about comfort—3-items	Cell 22 FT about comfort—3-items	Cell 23 Realistic negative evaluation about comfort—3-items	Cell 24 Self-acceptance about comfort—3-items

Table 3 Description of the four parceled data sets used in the confirmatory factor analyses, the cells that contributed to each parcel, and the parcels that contributed to each factor for each model tested

Parceled data set 1 = 24 parcels

Each cell is its own parcels.

1-Factor model is a one general factor that consisted of all 24 parcels: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, and 24.

The 2-factor model had two factors representing *irrationality* versus *rationality*. This CFA to test this model included all 24 parcels representing the 24 cells.

  Factor 1 consisted of parcels 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,

  Factor 2 consisted of parcels 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, and 24

The 3-factor model included one factor for each of the content domains of affiliation, achievement, and comfort. Each factor had 9 cells from 24 items.

  Factor 1 (affiliation) = parcels 1, 2, 3, 4, 13, 14, 15, and 16

  Factor 2 (achievement) = parcels 5, 6, 7, 8, 17, 18, 19, and 20

  Factor 3 (comfort) = parcels 9, 10, 11, 12, 21, 22, 23, and 24.

The 4-factor model had one factor for each of the 4 cognitive processes. Each factor included 6 parcels.

  Factor 1 (demanding/non demands preferences) consisted of parcels 1, 5, 9, 13, 17, and 21

  Factor 2 (Frustration intolerance/frustration tolerance) consisted of parcels 2. 6, 10, 14, 18, 22.

  Factor 3 (Awf/RNE) consisted of parcels 3, 7, 11, 15, 19, 23

  Factor 4 (Self-downing vs self-acceptance) consisted of parcels 4, 8, 12, 16, 20, 24.

8-Factor model—one factor for each of the irrational cognitive processes and one factor for each of the rational cognitive factors and each cell parcel consisted of three content parcels. This CFA includes 3 parcel per factor.

  Factor 1 Irrational demanding included parcels 1, 5, 9

  Factor 2 Irrational frustration Intolerance included parcels 2. 6, 10

  Factor 3 Irrational awfulizing included parcels 3, 7, 11

  Factor 4 Irrational self-condemnation consisted of parcels 4, 8, 12,

  Factor 5 Rational non-demanding preferences included parcels 13, 17, and 21

  Factor 6 Rational frustration tolerance consisted of parcels 14, 18, 22

  Factor 7 Rational realistic negative evaluations included parcels 15, 19, 23

  Factor 8 Rational self-acceptance included parcels 16, 20, 24

Parceling data set 2 = 12 parcels of irrational and rational beliefs

Parcel 1 Demanding/non demanding for affiliation = cells 1, and 13

Parcel 2 Demanding/non demanding for achievement = cells 2 and 17

Parcel 3 Demanding/non demanding for comfort = cells 9 and 21

Parcel 4 Frustration intolerance/frustration tolerance for affiliation = cells 2 and 14

Parcel 5 Frustration intolerance/frustration tolerance for achievement = cells 6 and 18

Parcel 6 Frustration intolerance/frustration tolerance for comfort = cells 10 and 22

Parcel 7 Awfulizing/realistic negative evaluations for affiliation = cells 3 and 15

Parcel 8 Awfulizing/realistic negative evaluations for achievement = cells 7 and 19

Parcel 9 Awfulizing/realistic negative evaluations for comfort = cells 11 and 23

Parcel 10 Self-condemnation/self-acceptance for affiliation = cells 4 and 16

Parcel 11 Self-condemnation/self-acceptance for achievement = cells 8 and 20

Parcel 12 Self-condemnation/self-acceptance for comfort = cells 12 and 24

CFA models For this 12 parcel data set the models would be:

1 General-factor model = Parcels 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.

2-Factor model representing Irrationality and Rationality—this model could not be done because *rational and irrational* items are combined within the same parcels

3-Factor model—one factor for each of the content areas of Affiliation, Achievement, and Comfort

  Factor 1 Affiliation = Parcels 1, 4, 7, 10—which is cells

  Factor 2 Achievement = Parcels 2, 5, 8, 11

  Factor 3 Comfort = Parcels 3, 6, 9, 12.

4-Factor model—four factors representing the 4 cognitive processes. Since there are *irrational and rational* items in each parcel, the factors represent the cognitive processes in their combined form

  Factor 1 (Demanding/non demanding) = parcels 1, 2, 3

  Factor 2 (Frustration intolerance/frustration tolerance) = parcels 4, 5, 6

  Factor 3 (Awfulizing/realistic negative evaluations) = parcels 7, 8, 9

  Factor 4 (Self-condemnation/self-acceptance) = parcels 10, 11, 12

Table 3 (continued)

Parceling data set 3–12 parcels of rational beliefs

Parcel 1 Non-demanding for affiliation = cell 13

Parcel 2 Non demanding for achievement = cell 17

Parcel 3 Non demanding for comfort = cell 21

Parcel 4 Frustration tolerance for affiliation = 14

Parcel 5 Frustration tolerance for achievement = cell 18

Parcel 6 Frustration tolerance for comfort = cells 22

Parcel 7 Realistic negative evaluations for affiliation = cell 15

Parcel 8 Realistic negative evaluations for achievement = cells 19

Parcel 9 Realistic negative evaluations for comfort = cells 23

Parcel 10 Self-acceptance for affiliation = cells 16

Parcel 11 Self-acceptance for achievement = cell 20

Parcel 12 Self-acceptance for comfort = cell 24

For this parceled data set the CFA Models would be:

1-Factor model = Parcels 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12. Each parcel only contains rational belief

2-Factor model—this could not be done because the parcel only have rational belief items.

3-Factor model—one factor for each of the content areas of Affiliation, achievement, and comfort

Factor 1 Affiliation = parcels 1, 4, 7, 10

Factor 2 Achievement = parcels 2, 5, 8, 11

Factor 3 Comfort = parcels 3, 6, 9, 12.

4-Factor model—four factors representing the 4 rational cognitive processes.

  Factor 1 Non-demanding preferences) = parcels 1, 2, 3

  Factor 2 (Frustration tolerance) = parcels 4, 5, 6

  Factor 3 (Realistic negative evaluations = parcels 7, 8, 9

  Factor 4 (Self-acceptance) = parcels 10, 11, 12

Parceling data set 4–12 parcels of Irrational Beliefs

Parcel 1 Demanding for affiliation = cell 1

Parcel 2 Demanding for achievement = cell 5

Parcel 3 Demanding for comfort = cell 9

Parcel 4 Frustration intolerance for affiliation = cell 2

Parcel 5 Frustration intolerance achievement = cell 6

Parcel 6 Frustration intolerance for comfort = cells 10

Parcel 7 Awfulizing for affiliation = cells 3

Parcel 8 Awfulizing for achievement = cell 7

Parcel 9 Awfulizing for comfort = cell 11

Parcel 10 Self-condemnation for affiliation = cell 4

Parcel 11 Self-condemnation for achievement = cell 8

Parcel 12 Self-condemnation for comfort 12

For this parceled data set the CFA Models would be:

1 general-factor model = Parcels 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.

2-factor model—representing irrationality and rationality. This cannot be done because the parcel only have *irrational* belief items

3-factor model—one factor for each of the content areas of Affiliation, Achievement, and Comfort

Factor 1 Affiliation = Parcels 1, 4, 7, 10

Factor 2 Achievement = Parcels 2, 5, 8, 11

Factor 3 Comfort = Parcels 3, 6, 9, 12.

4-factor model—four factors representing the 4 cognitive processes.

  Factor 1 (Demandingness) = parcels 1, 2, 3

  Factor 2 (Frustration intolerance) = parcels 4, 5, 6

  Factor 3 (Awfulizing) = parcels 7, 8, 9

  Factor 4 (Self-condemnation) = parcels 10, 11, 12

3. Table 2 presents the factor structure of the ABS-2 and the TABS. Each cell is numbered, so, the cell number represents what factors are represented by that cell. Table 3 presents which cells were combined to make up each parcel in the four parceled data sets and which parcels were identified to load on each factor in the CFA models tested.

Twenty-Four Parcels

We calculated 24 parcels scores each of 3 items each. Each parcel represented one of the 24 cells of the ABS-2 provided by DiGiuseppe et al. (2020) and that appears in Table 2. There are 12 parcels for IBs and 12 parcels for RBs. Each parcels represented one of the four cognitive processes in either its irrational form or rational form and included one of the three content areas. This parcel configuration allowed us to test the model Hyland et al. (2014) thought was the best. For the 24 parcels, we tested a one-factor model, a two-factor model representing irrational and rational beliefs, a three-factor model representing the three content areas, a four-factor model representing the four cognitive processes, and an eight factors model representing the four cognitive processes in their irrational and rational forms.

Twelve Parcels with Each Parcel Containing Both Irrational and Rational Beliefs

In this parceling, each parcel contained three irrationally worded items and three rationally worded items. Thus, we created three parcels for the cognitive process of awfulizing/realistic negative evaluation. This included one parcel for each of the three content domains of affiliation, achievement, and comfort. We created three parcels for the cognitive process for the demandingness/non-demanding preference cognitive process—one for each of the three content domains. We created three parcels for the cognitive process of frustration intolerance/frustration tolerance beliefs cognitive process—one parcel for each of the three content domains. Finally, we created three parcels for the cognitive process of self-condemnation/self-acceptance beliefs cognitive—one parcel for each of the three content domains.

For this parceling method, we tested a one-factor model representing one general factor, a three-factor model where each factor represents one of the three content domains, and a four-factor model where each factor represents one of the four cognitive processes.

Twelve Parcels of Rational Beliefs

To test the four-factor model of rational cognitive processes, we created 12 RB parcels from the 36 RBs items of TABS, with three parcels for each of the rational cognitive processes. The result included: (1) thee parcels representing realistic negative evaluations—one parcel for each of the three content domains of affiliation, achievement, and comfort, (2) three parcels representing non-demanding

preference—one for each of the three content domains, (3) three parcels for frustration tolerance beliefs—one parcel for each of the three content domains, and (4) three parcels self-acceptance beliefs—one parcel for each of the three content domains. Using this parceling procedure, we could also test whether rational beliefs would yield factors by the content domains.

Twelve Parcels of Irrational Beliefs

To test the four-factors model that represents the REBT theorized model that there are four cognitive processes for *irrational beliefs,* we created 12 IB parcels from 36 IBs items of TABS. The resulting parcels included irrational cognitive processes represented (1), three demandingness parcels—one three item parcel of the content areas of affiliation, achievement, and comfort, (2) three awfulizing parcels, one three item parcel of the content areas of affiliation, achievement, and comfort, (3) three frustration intolerance parcels—one three item parcel of the content areas of affiliation, achievement, and comfort, and (4) three self-condemnation parcels, one three item parcel for the content areas of affiliation, achievement, and comfort. Using this parceling procedure, we could also test whether irrational beliefs could form factors representing the three the content domains.

Analysis Strategy for CFA Models

For the 24-parcel data set, we tested a one-factor model, a three-factor model, a four-factor, an eight-factor model, and a second-order model. These procedures appear in Table 2 and the results appear in Table 4.

For each of the 12-parcel dataset with each parcel containing both irrational and rational beliefs, we tested a one-factor model, a three-factor, a four-factor, and a second-order model. These models appear in Table 2 and the results appear in Table 5.

For the 12-parcel that include only rational or only irrational items, we tested a one-factor model, a three-factor model, a four-factor, and a second-order model. These parceling instructions and the models appear in Table 3. The results appear in Tables 6 and 7.

The LISREL program yielded the following fit indices to evaluate the models: Chi Square (χ^2), the ratio of the Chi Square divided by the degrees of freedom (χ^2/df), the Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residuals (SRMR), the Goodness of Fit Index (GFI), the Comparative Fit Index (CFI), the Incremental Fit Index (IFI), the Relative Fit Index (RFI), and the Normed Fit Index (NFI). The indices that most influenced this decision were the AIC, which is used for comparing models in structural equation modeling (Akaike 1974) and the χ^2/df values. We did this for CFA models.

Table 4 The fit indices statistics for CFA for the 24, three-item parcels that include either irrational or rational belief items for 1-factor, 2-factor, 3-factor, and 4-factor models of the TABS

Models	χ^2	df	χ^2/df	RMSEA	SRMR	GFI	CFI	IFI	RFI	NFI	AIC
1 Factor	5038.13	252	19.992	0.264	.23	.39	.46	.46	.38	.43	5355.56
2-Factors	1088.41	251	4.336	0.111	.10	.75	.81	.81	.74	.76	1412.45
3-Factors for 3 content domains	4994.60	251	20.05	0.264	.23	.40	.46	.46	.37	.44	5331.87
4-Factors for 4 cognitive processes	4893.80	246	15.86	0.263	.23	.40	.47	.48	.38	.45	5250.91
8 Factor model	811.60	224	3.336	0.098	.08	.80	.86	.86	.77	.81	1314.20
Sec-Ord on to four cognitive processes	5605.71	248	22.60	0.280	.24	.37	.41	.41	.32	.39	5949.59

X^2 = Chi Square Goodness, χ^2/df = ratio of χ^2 to df, RMSEA Root Mean Square Error of Approximation, SRMR Standardized Root Mean Square Residuals, GFI Goodness of Fit Index, CFI Comparative Fit Index, IFI Incremental Fit Index, RFI Relative Fit Index, NFI Normed Fit Index, Sec-Ord Second Order Model

Table 5 The Fit Indices Statistics for CFA for the 12 -item parcels that include *irrational and rational* belief items

Models	χ^2	df	χ^2/df	RMSEA	SRMR	GFI	CFI	IFI	RFI	NFI	AIC
1 Factor	151.69	54	2.809	0.081	0.19	.97	.96	.96	.92	.94	310.41
3-Factor model for 3 content domains	149.81	51	2.937	0.084	0.19	.97	.96	.96	.92	.94	328.36
4-Factors for 4 cognitive processes	125.13	48	2.206	0.077	0.16	.98	.97	.97	.93	.95	323.52
Sec-Ord on to four cognitive processes	139.60	50	2.792	0.077	0.17	.98	.97	.97	.93	.95	315.76

X^2 = Chi Square Goodness, χ^2/df = ratio of χ^2 to df, RMSEA Root Mean Square Error of Approximation, SRMR Standardized Root Mean Square Residuals, GFI Goodness of Fit Index, CFI Comparative Fit Index, IFI Incremental Fit Index, RFI Relative Fit Index, NFI Normed Fit Index, AIC Akaike's information criterion, Sec-Ord Second Order Model

Table 6 The Fit Indices Statistics for CFA for the 12, three-item parcels that include only *rational* belief items for 1-factor, and 4-factor models of the TABS

Models	χ^2	df	χ^2/df	RMSEA	SRMR	GFI	CFI	IFI	RFI	NFI	AIC
1-Factor	119.48	54	2.212	0.067	0.15	.98	.97	.97	.93	.94	278.20
3-Factors for 3 content domains	116.34	51	2.811	0.069	.14	.98	.97	.97	.93	.94	294.90
4-Factors for 4 cognitive processes	96.07	48	2.001	0.061	.12	.98	.98	.98	.94	.95	294.46
Sec-Ord on to 4 cognitive processes	96.28	50	1.925	0.058	.12	.98	.98	.98	.94	.95	281.44

χ^2=Chi Square Goodness, χ^2/df=ratio of χ^2 to *df*, *RMSEA* Root Mean Square Error of Approximation, *SRMR* Standardized Root Mean Square Residuals, *GFI* Goodness of Fit Index, *CFI* Comparative Fit Index, *IFI* Incremental Fit Index, *RFI* Relative Fit Index, *NFI* Normed Fit Index, *AIC* Akaike's information criterion, *Sec-Ord* Second Order Model

$p < 0.0001$

Table 7 The Fit Indices Statistics for CFA for the 12, three-item parcels that include only *irrational* belief items for 1-factor, and 4-factor models of the TABS

Models	χ^2	df	χ^2/df	RMSEA	SRMR	GFI	CFI	IFI	RFI	NFI	AIC
1-Factor	182.00	54	3.568	0.093	0.23	.97	.93	.93	.89	.91	340.72
3-Factors for 3 content domains	169.22	51	3.318	0.092	0.21	.97	.94	.94	.89	.91	347.78
4-Factors for 4 cognitive processes	154.37	48	3.299	0.090	0.20	.97	.94	.94	.89	.92	352.77
Sec-Ord on to 4 cognitive processes	154.96	50	3.099	0.088	0.20	.97	.94	.95	.90	.92	340.13

X^2=Chi Square Goodness, χ^2/df=ratio of χ^2 to df, *RMSEA* Root Mean Square Error of Approximation, *SRMR* Standardized Root Mean Square Residuals, *GFI* Goodness of Fit Index, *CFI* Comparative Fit Index, *IFI* Incremental Fit Index, *RFI* Relative Fit Index, *NFI* Normed Fit Index, *AIC* Akaike's information criterion, *Sec-Ord* Second Order Model

CFA Results of Parcel 1

Table 4 presents results for analyses for the CFA models for 24 parcels, and the χ^2, χ^2/*df*, RMSEA, SRMR, GFI, CFI, IFI, RFI, NFI, and the AIC for the one-factor, two-factor, three-factor, and four-factor models. None of the models had results that meet the criteria for an acceptable fit. Therefore, the CFA with the 24 three-item parcels did not fit the factor structure proposed by the DiGiuseppe et al. (2018, 2020) for the ABS-2 and used in the TABS. The model with the best fit was the two-factor model that had the parcels load on either an irrational or a rational factor. Although the fit indices for this model failed to reach acceptable criteria, we used these results as a rational to complete further analyses that divided the TABS 12 parcels for both irrational and rational items. The fact that our EFA yielded a two-factor solution for irrational and rational belief factors further supports this decision to divide the TABS into two scales, one representing RBs and one representing IBs.

For all the models we tested across each parceling set the data yielded high correlations between the latent variables, some as high as close to 1 and some greater than one. These factor correlations represent a high degree of multicollinearity in the data (Joreskog 1999).

CFA Results for Parceling Data Set 2

Table 5 presents the results for the CFA models for the 12-parcel dataset where the parcels included both *rational* and *irrational* items, and the χ^2, the χ^2/*df*, RMSEA, SRMR, GFI, CFI, IFI, RFI, NFI, and AIC for the one-factor, three-factor, four-factor, and second-order four cognitive process hierarchical models. The one-factor, three-factor, four-factors, and second-order factor all had excellent fit indices. The fit indices are very close. Determining which model has the best fit is difficult because of the small difference between them. If one used the AIC Model value as the model of best fit, *the one-factor model* appears best. However, *the second order four cognitive processes model* (AIC = 315.76) is only .05 indices higher value on the AIC *from the one-factor model (*AIC = 310.41). If one used the value of the χ^2/*df*, the *four-factor model* representing cognitive processes has the lowest value at 2.206. The χ^2/*df,* SRMR, and RMSEA as the best fit indices because they asses the residual variance not accounted for by the modes, then the *four-factors for four cognitive processes* is the best model.

The model that most reflect the REBT theory, *the second-order four cognitive processes model*, which proposes that four cognitive processes contribute to a general irrational factor (DiGiuseppe et al. 2018). We believe that these fit indices justify this theoretical model (Table 5 and Fig. 2).

CFA Results for Parceling Data Set 3

Table 6 presents the results for analyses for the CFA models (the one-factor, three-factor, four-factor models, second-order models) for 12-parcels datasets where the
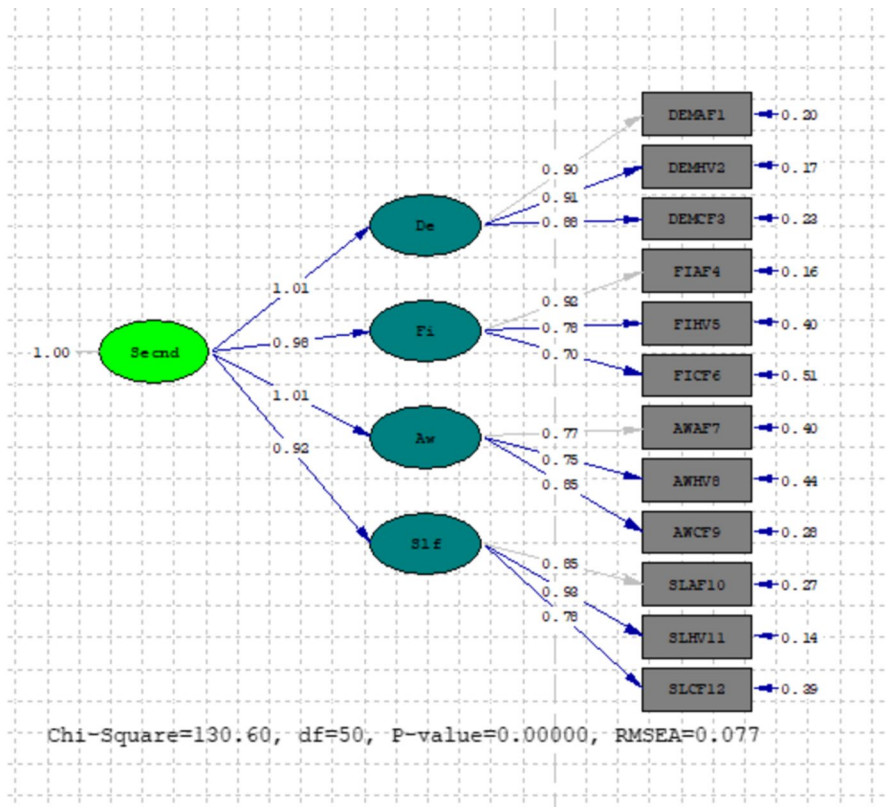
Fig. 2 Results of CFA for *the second-order four cognitive processes model* of the TABS with 12 Parcels that *irrational and rational* beliefs. *Note*: Observed variables include both irrational and rational beliefs items. De: Demandingness, Fi: Frustration Intolerance, Aw: Awfulizing, Slf: Self Downing/global condemnation

parcels include rationally worded items only. The *second-order model* has four-factors representing the cognitive processes that all contribute to a second-order general factor. In this parceled dataset of rationally worded items, all of the models yielded excellent mode fit. It is difficult to determine the best fitting model because the fit indices are so close to each other. If we used the lowest AIC to determine the best fit, it would be the *one-factor model*. If we used the lowest χ^2/df, the *second-order cognitive process model* would have the best fit. The *second-order cognitive process model* also has the lowest values for RMSEA and SRMR indicating it was the model with the least residual variance. Also, the *4-factors four-cognitive processes model* and the *second-order cognitive process model* (Fig. 3) have slightly high indices on the CFI, IFI, and RFI than other models.

We believe that the theoretical model that bests the REBT theory, four cognitive processes that contribute to a general irrational factor, is justified by these fit indices (Table 6 and Fig. 3).
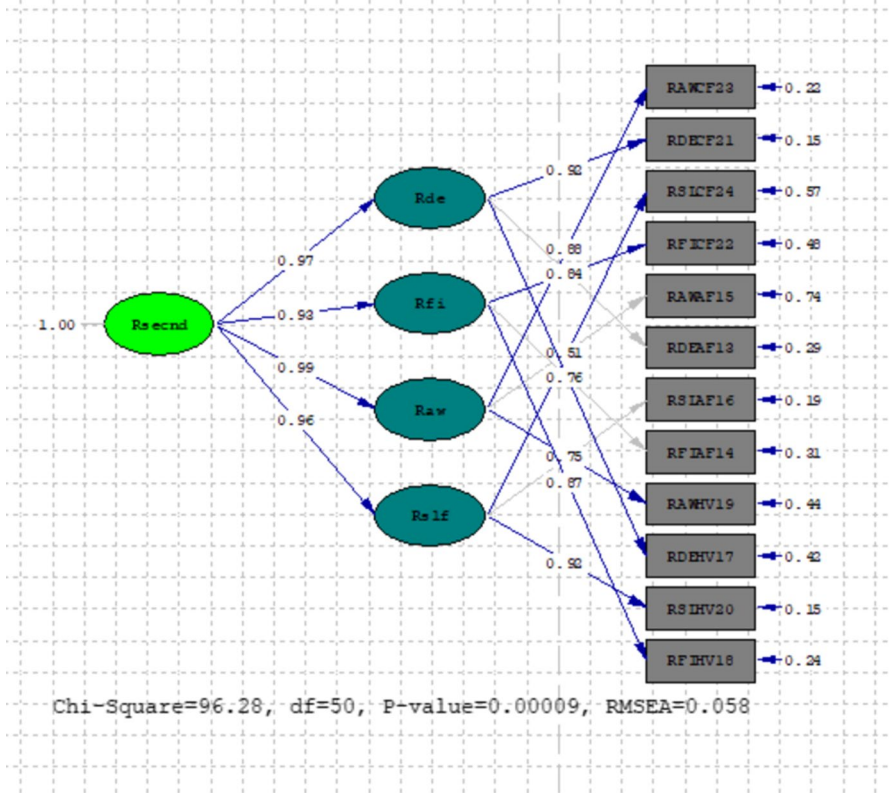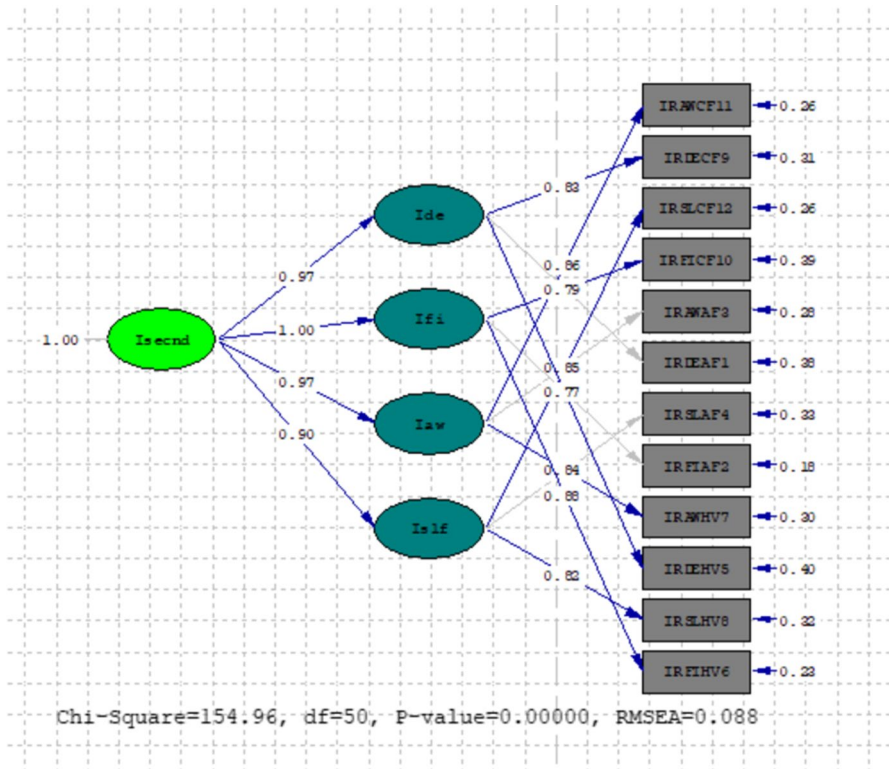
Fig. 3 Results of CFA Second-Order 4 cognitive processes model of the TABS with 12 Parcels that rational beliefs. *Note*: Observed variables include rational beliefs items. Rde: non-demanding preferences, Rfi: rational frustration tolerance, Raw: rational realistic negative evaluations, Rslf: rational self and other acceptance

For the four subscales that emerged from the four-factor of rational beliefs, we calculated the internal consistency using Cronbach's α. The results were, TABS non-demanding preference items have α=.75, realistic negative evaluations items have α=.71, self-acceptance items have α=.77 and frustration tolerance items have α=.71 internal consistency coefficients.

CFA Results for Parceling Data Set 4

Table 7 presents the results for analyses for the CFA models for 12 parcel datasets where the parcels include *irrational* items only, and the χ^2, χ^2/df, RMSEA, SRMR, GFI, CFI, IFI, RFI, NFI, and the AIC for the one-factor, three-factor, four-factor, and Second-Order 4 cognitive processes model where four contrive process factors contribute to one higher order general factor. In this parceled dataset of irrational items, all of the models have an excellent fit. The results indicated that one could

achieve a good fit by organizing the factor structure of parceled irrational items by either cognitive processes or the contents domains. The correlations between latent variables of the four irrational cognitive processes were substantial and suggested that irrational cognitive processes are highly related. The correlation between Demandingness and Self-Condemnation as 82; between Demandingness and Frustration Intolerance was .86; between Demandingness and Awfulizing was .87; between Awfulizing and Frustration Intolerance was .96; between Awfulizing and Self-Condemnation was .80 and between Self-Condemnation and Frustration Intolerance was .74. *Second-Order 4 cognitive processes model* (Fig. 4) emerged as the best fitting model. It had the lowest AIC, but just marginally. It had the lowest χ2/df. The RMSEA, which indicated the degree of residual variance, was also the lowest of all the models.

Fig. 4 Results of *Second-Order 4 cognitive processes model* CFA 3 factors cognitive PROCESS model of the TABS with 12 Parcels that *irrational* beliefs. *Note*: Observed variables include rational beliefs items. Ide: irrational demandingness, Ifi: irrational frustration intolerance, Iaw: irrational catastrophizing/awfulizing,Islf: irrational global condemnation of human worth (self/others/life downing)

Study V: Criterion-Related Validity

Participants and Procedures

To test for the criterion validity of the TABS, we explored the relationship between the TABS with another test of IBs, the Irrational Beliefs Test (IBT), the Brief Symptom Inventory (BSI), and the Needs for Absolute Truth (NAT) in two separate samples. We recruited 339 volunteers from the Istanbul province for convergent validity (N = 139) and construct validity (N = 200). The participants volunteered and represented a convenience sample. We created a form to assess the demographic characteristics of the participants such as age, gender, educational level, and economic status. After an initial meeting to obtain consent, the approximate administration time for both groups to complete all the surveys was 25 min.

The Sample for Convergent Validity

In the first sample, the TABS was compared with the Jones (1969) the Irrational Beliefs Test (IBT). The IBT was translated into Turkish by Yurtal-Dinç (1999). This sample consisted of 139 participants was 54% women. They were call-center workers. This sample ranged in age from 20 to 49 years, with a mean of 26.9 (SD = 4.71). The results of questions concerning the education level of participants revealed that 46.0% completed high school, 18% achieved a bachelor's degrees, 7.2% of them had graduate degrees, and 30.8% of the participants did not report their education level. Questions concerning the economic status of these participants indicated that 38.9% of the respondents reported that they earn 1500 Turkish Lira (TL) monthly, 22.3% reported earned between 1500 and 3000 TL, 15.1% of respondents' the monthly earnings was over 3000 TL, and 22.7% of the participants failed to report their economic status.

The Sample for Construct Validity

The second sample consisted of 200 participants with an easy sample method, including 100 women (50%) and 100 males (50%). They were call-center workers, finance company employees, and some audiences of a congress that held in held in Istanbul Congress Center. The age of participants ranged from 18-to 30 with a mean of 25.28 (SD = 3.35). Their education level of participants was varied with 2% of participants having completed only elementary school, 26.5% completed high schools, 37.6% of participants completed a university degree, 11% of participants had a graduate diploma, while 29.9% of the participants failed to report their education level.

Instruments

Irrational Beliefs Test The Irrational Beliefs Test (IBT: Jones 1969) was designed to assess the original 11 irrational beliefs proposed by Ellis (1962). However, the final scale construction divided the test had ten sub-scales that measured subscales labeled need for approval, dogmatic demands, disturbances, desperation thoughts, and perfectionism. Each of these scales includes ten items based on Likert five-point scale (Jones 1969). Low scores demonstrate more rational beliefs and high score represent irrational beliefs (Bridges and Sanderman 2002). Jones (1969) reported the reliability of the test, using test–retest ($r = .92$); the reliability of the ten subscales ranged from $r = 66$ to 80. The total test score reliability coefficient was $\alpha = .71$. Farakhbakhsh (1993) and Moradi et al. (2010) supported the IBT's validity. In the original Turkish version of the IBT (Yurtal-Dinç 1999), ten sub-scale 100 items were reduced to 45 items in 8 sub-scales during the adaptation of this scale to Turkish. A factor analysis of this data yielded two subscales as irrational and rational beliefs, as it has not come out of eight sub-scale structures. Yurtal-Dinç (1999) found $\alpha = 0. 74$ as a coefficient of internal consistency. In this research, its internal consistency for the total score of the IBT was $\alpha = 0.85$.

Brief Symptom Inventory (BSI) The BSI is a multi-dimensional symptom screening scale developed by Derogatis (1992). İt was developed to detect psychological symptoms in various psychiatric and medical patients. The original scale has 90 items, and a short version of the scale consists of 53 items. A Turkish version was translated and researcher performed by Sahin and Durak (1994). The internal consistency coefficient based on Cronbach's α equaled .95. The scale consists of five subscales of anxiety, depression, negative affect, somatization, and hostility. In this study, we used the anxiety (13 items) and depression (12 items) subscales. The internal consistency coefficient of the anxiety subscale was $\alpha = 0.88$, depression subscale was. $\alpha = 0.91$ in this study.

Needs for Absolute Truth (NAT) This scale was developed to measure a person's degree of needing to find absolute truth about oneself (Şimşek 2013). The NAT consist of 5 items with a single dimension. The items of the scale are "(1) I always want to find the truth about myself. (2) I think I'm different from what I live with." (3) "I hope that someday I will discover who I really am." (4) "I always thinking what the truth about myself is." (5) "I think what my experiences mean more than I experience." High scores are positively related to negative psychological variables such as depression and anxiety and negatively correlated to positive psychological variables such as self-esteem (Şimşek (2013). The internal consistency coefficient of the scale is $\alpha = .74$. In this study, the internal consistency calculated as Cronbach's $\alpha = .80$.

Results

To test the Criterion-Related Validity of the Turkish form of TABS, we explored the relationship between the TABS with the IBT, the anxiety and depression sub-scales of the BSI's, and the NAT. Its validity was investigated by calculating the Pearson

Table 8 Correlations of TABS subscales of irrational and rational beliefs with BSI's anxiety and depression subscales, and with the NAT scale

Variable	M	SD	1	2	3	4	5
1. IB's TABS	14.06	4.48	1				
2. RB's TABS	89.74	20.27	.21**	1			
3. BSI's anxiety	96.28	21.91	.37**	− .01	1		
4. BSI's depression	20.68	8.07	.33**	− .03	.85**	1	
5. NAT	21.01	8.74	.28**	− .05	.37**	.40**	1

IB's Irrational beliefs, *RB's* Rational beliefs, *TABS* Turkish Attitudes and Beliefs Scale, *BSI* Brief Symptoms Inventory, *NAT* Total score of the need for absolute truth

$N = 200$; ** $p < 0.01$

Product Moment correlation coefficient. The SPSS 20.0 Program was used for this analysis. These results appear in Table 8.

In the first sample, the correlation ($p < 0.001$) between the total score of TABS rational beliefs ($M = 94.52;\ SD = 23.85$) and the total score of the rational beliefs of the IBT was $r = .45$ ($M = 87.40;\ SD = 14.12$). The total scores of irrational belief items of TABS ($M = 100.19;\ SD = 23.64$) and IBT ($M = 56.80;\ SD = 11.74$) have been moderately correlated each other ($r = 0.55$) ($p < 0.001$).

In the second sample, we compared the TABS with BSI's sub-scales of anxiety and depression and the NAT. The relationship between TABS irrational subscale and depression were significantly and positively correlated ($r = 0.32;\ p < 0.01$), as it was with anxiety ($r = 0.37;\ p < 0.01$). The TABS irrational beliefs subscale and the NAT was positively and significantly correlated ($r = 0.28;\ p < 0.01$). On the other hand, the TABS RB subscale was significantly but negatively correlated with depression, anxiety, and with the NAT. However, the correlations between the TABS RB subscales were not. These results provide support for the TABS IB subscale but fail to provide support for the TABS RB subscale.

General Discussion

This study analyzed the factor structure and the psychometric qualities of the Turkish Attitudes and Beliefs Scale, a Turkish translation of the ABS-2. The adaptation of a scale into a different language is challenging. This translated instrument provides the ability to examine cultural differences in the REBT theoretical constructs and test the REBT theory in another culture. Such translations are important to the growth of psychological knowledge and the unification of the field by allowing us to study all people (Hambleton 2005; Vlachopoulos et al. 2010). More research on the translations of REBT scales is needed to test the hypotheses of REBT. This research showed that among bilingual scholars of Turkish and English could reach agreement on the translation of the items from English to Turkish and back again form Turkish to English. Also, bilingual

participants who spoke Turkish and English answered the items in a similar manner. Thus, the translation process there was successful.

The ABS-2 reflects the theoretical model of the four irrational cognitive processes and their corresponding RB equivalents that is central to REBT theory and the basis of clinical practice (DiGiuseppe et al. 2014; Ellis and Dryden 1997). The fact that factor analytic studies have failed to confirm this model of the ABS-2 is a disappointment for advocates of REBT. The large number of items and the large number of subscales makes the ABS-2 a complicated scale. This complicated model and the large number of items has made it difficult to attain acceptable fit indices validating the model. Hyland et al. (2014) thought that the item structure of the ABS-2 that has each item represent a cognitive process, and a content area confounded the scale to a significant degree. They develop an abbreviated version of the ABS-2 to reduce the complexity and increase the chances of attaining acceptable fit indices. However, the results for this have been inconsistent (Hyland et al. 2017). DiGiuseppe et al. (2020) found that splitting the ABS-2 into separate irrationality and rationality scales improves but does not solve the poor fit indices problem. They also found that the latent variables representing the four cognitive processes were highly correlated, making it difficult to attain an adequate model fit. Their EFA found that factors were more likely to form around content areas than cognitive processes.

The most important aspect of this paper is our EFA and CFA results. Our EFA confirmed the results of DiGiuseppe et al. (2018) that irrational and rationality emerge as the two broad factors of the TABS. As a result, we included CFA models that looked at IB items and RB items separate. We next employed CFA because it provides a stronger analysis in determining factor validity and structure than does EFA (Orcan 2018). The CFA analysis presents a much different structural coefficient matrix and model fit values than the EFA statistics, so it treats the structure validity differently (Marsh et al. 2006; Schmitt and Sass 2011). CFA analyzes are used to determine whether the factor structures differ according to the predicted item distributions and to determine the variables that are desired to be measured by the scale in the sense of structure (Sümer, 2000).

The unique aspect of this study was the use of item parceling to reduce the complexity of the scale structure and number of items to attain better fit indices. We used four different parceling procedures. Unlike the previous attempts to factor analyze the ABS-2 in English (DiGiuseppe et al. 2018; Hyland et al. 2014; Hyland et al. 2017) and in Romanian (Fülöp 2007) that failed to attain adequate fit indices, our analyses produced acceptable to excellent fit indices. We do not believe that these positive results resulted because the test was translated into the Turkish language, but resulted from using the parceling technique. We recommend that future research using a full-length version of the ABS-2 or other similar scales measuring irrational beliefs use item parceling.

When the parcels represented the 24 cells of the ABS-2 structure, the result still did not yield adequate fit indices. We suspect that this occurred because each of the 24 parcels still represented too complex a model for CFA procedures to yield an adequate fit. Also, this data set still included IBs and RBs. However, similar to our EFA results, and the EFA results of DiGiuseppe et al. (2020), the best fitting model was the eight-factor model representing four irrational cognitive processes and four

rational cognitive processes. The second best fitting model was the two-factor model that separated items in irrationality and rationality.

The second parceling procedures that collapsed the irrational and rational items into the same cells achieved an adequate fit does propose that IB and RB items can yield an adequate factor suture when they are collapsed so that combined reverse scored rationality items are in the same direction so that higher scores lead to less rationality and more irrationality. All four models tested with this parceling procedure, the one-factor, three-factor, four-factors, and second-order factor, had an adequate fit and the difference between fit indices are very close. Determining which model fits best is difficult because of the small difference between them. Using the scientific principle of parsimony, we recognize that one could easily interpret these results to indicate that irrational and rationality represents one factor. If REBT theory is correct and IRs contribute to psychopathology, a general factor for IBs and RBs would be consistent with research that shows that there is a general P factor for psychopathology Caspi et al. (2014). However, although the latent factors in this analysis were highly correlated the result does support that within a general factor some variance is explained by the different cognitive processes. The identification of the different cognitive processes is important clinically. I psychology treatments one to teach patients to challenge some beliefs and to replace some dysfunctional beliefs with more functional and adaptive beliefs.

Based on our EFA data, the CFA results for the 24 cell parcel and previous research by DiGiuseppem et al. (2018) we did create separate parcels that included only RBs and IBs. Most other measures assess Ellis constructs measure irrationality exclusively and rarely include items reflecting RBs. In this research, the 36 rational worded items were factorially different from the 36 irrationally worded items. The inclusion of measuring RBs along with IBs could help identify the mechanism of change in REBT. Correcting IBs might not be necessary of sufficient improve patient's problems. Does psychotherapy help patients by reducing their IBs or increasing their RBs, or changing the ratio between the two? We do not know yet whether it is best in sessions and in homework activities for therapists to work at challenging IBs or getting patients to rehearse RBs? Does targeting IBs or RBs in session have teh best clinical outcome? Also, does challenging one set of beliefs change the other? We can These question can answer these questions with a measure such as the TABS that measure both constructs. Thus, the assessment of IBs and RBs separately allows us to answer important questions about the mechanism of change in REBT, CBT and other forms of psychotherapy. This is another reason we chose to create parcels three and four that included only RBs or only IBs.

For parcel three that included only *rationally* worded items, all four models had an excellent fit. Again, one could argue that given the scientific value of parsimony, a one-factor model, while not the best fit, is close enough to the best to be accepted as the model representing the TABS. However, the second-order model that the best fit on the χ^2/*df,* RMSEA, NFI. It yielded the same values as the four-factor model on the SRMR, GFI, CFI, and IFI. However, the one-factor model had the lowest AIC. Thus these models are very close. Thus, the second order-factor with four rational cognitive processes contributing to one general factor appears to have the best fit.

A similar pattern of results occurred with parcel four that included only ir*rationally* worded items. Again, all four models had an excellent fit. Again, one could use parsimony to accept the general factor as the best model given the closeness of the values between the models. However, the second-order model that the best fit on the χ^2/df, RMSEA, RFI, RFI, and AIC. It yielded the same values as the four-factor model on the SRMR, GFI, CFI, and NFI. Again the latent variables were highly correlated.

We think that the model that might best explain the nature of irrational beliefs is the fact model of Guttman and Greenbaum (1971), which has been used mostly in the development of measures of cognitive abilities. Although psychologists recognize and accept that there is a general g factor in intelligence, they also recognize that there are specific cognitive abilities that contribute to g, but have a degree of independence. Future studies in IB and RBs might want to incorporate the statistical approaches used recommended by facet theory.

Another noteworthy finding emerged from our CFA analysis was the findings concerning the scoring of the scales based on the three content domains. Hyland and colleges (2014; 2017) point out that the ABS-2 items, and by extension the TABS items, are confound between content and cognitive processes that result from the way the items were written. Many scales that test REBT, and perhaps other variants of CBT, have this problem. If one measures demandingness, the items need to reflect something that the person is demanding. Also if one makes a cognitive error reflect all or nothing thing, the thinking has to be about something. Rather than consider the three contents as a nuisance factor, we tested models for all four of our parceling procedures to test a three-factor solution where the factors represented achievement, affiliation, and comfort. For parceling procedure one, this did not yield an adequate fit (see Table 4). However, for parceling procedure two (see Table 5), parceling procedure three (see Table 6) and parceling procedures four (see Table 7) these models did yield acceptable, good fit indices, although they were not the best fitting models. We believe that this supports the original purpose of the authors of the ABS-2 that the scale could be used to create subscales that focused on cognitive processes of content domains. Future research might use affiliation domain items to study social phobia, avoidant personality disorders or other problems that focus on affiliation issue. The same could be done with the achievement of comfort items. We think research should continue to explore means of studying IR and RBs without the content embedded in the items. However, Burgess (1989, 1990) and DiGiuseppe and Leaf (1990) found that more personal the items that reflected the beliefs of the person correlated high with measures of disturbance than items that were more general. Content-less items might appear more general and less personalized, For this reason, However, we predict that content-less scale will correlate significantly lower with measures of psychopathology, than scales with content infused with the IBs and RBs.

Our results indicated that the TABS demonstrated good internally consistent. Irrational beliefs items and rational beliefs items. Also, the TABS correlated significantly with measures such as the Brief Symptom Inventory, the Needs for Absolute Truth, and the Jones Irrational Beliefs Test (Jones 1969). In this research, the IB subscale of TABS demonstrated a stronger relationship with NAT, anxiety,

and depression then RB subscale. RB sub-scale found to be not related to anxiety, depression and NAT variables in this data set. This result is inconsistent with other research which indicated a relationship with other psychological variables such as disturbed emotions, satisfaction with life, anxiety, anger scale (DiGiuseppe et al. 2018). Perhaps this situation showed that rational beliefs correlate with more positive emotions. Future research can investigate this issue. The total score of TABS' rational beliefs, the total score of the rational beliefs of IBT, and the total scores of irrational beliefs of both scales are in harmony with the existing scale of the English version of the ABS-2.

Other versions of the ABS-2 have correlated significantly with Big Five personality variables of neuroticism (Sava 2009), and with measures of depression (Podina et al. 2005), post-traumatic stress disorder (Hyland 2014), personality disorders and psychopathology scales of the Millon Clinical Multiaxial Inventory, as well as Satisfaction with Live. Future research with the TABS could expand upon the criterion-related validity and administer the TABS with other measures of psychopathology and personality.

Except for the ABS-2 and the measures that were based upon it, most other measures of REBT have neglected to provide separate subscales of the four cognitive process that would allow researchers to test the theoretical assumptions (DiGiuseppe et al. 2018). The old measurement tools used in REBT relied on the eleven beliefs that Ellis (1962) originally devised.

Although the ABS-2 and the TABS have good psychometric qualities, there are some limitations in the existing research. First, researchers need access to a large criterion sample of participants who completed the source language version of the measure. Second, test re-test study could be replicated with a broader sample. Third, the participants of studies were from different age groups, the participants in validation studies were convenience samples. Fourth, because the sample was drawn from a nonclinical population, it is not known whether the findings can translate into clinical populations. Therefore, longitudinal research is needed for clinical samples. Although satisfactory reliability and validity of TABS were demonstrated, more investigations are needed in item definition, the structure of the scale and correlation studies on rational beliefs. However, initial psychometric estimates appear promising, the evidence of construct validity of the TABS could be supported through additional convergent validity studies with theoretically related constructs.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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