The Jordanian Version of the Thought Control Questionnaire Insomnia-Revised (TCQI-R)

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Abstract

Individuals suffer from insomnia through the presence of extraneous thoughts. Furthermore, there are cognitive and behavioral aspects, which afflict a person when they have insomnia. In this context, there are strategies to address these thoughts. The Thought Control Questionnaire: Insomnia-Revised (TCQI-R) is a self-reporting instrument that aims to evaluate the strategies used by individuals to control their thoughts when suffering from insomnia. This study aimed to translate and adapt the TCQI-R to the Jordanian society. In this study, the questionnaire was applied to a sample of 361 participants aged between 19 and 61 years, of which 210 were women (58%). The principal component analysis determined five components: reappraisal, cognitive distraction, aggressive suppression, worry, and behavioral distraction. Each of the total scores of the questionnaire ($\alpha=0.90$) and its five components (Cronbach's α between 0.75 and 0.83) demonstrated high internal consistency. The results of the triple analysis of variance established that the instrument can distinguish between depressed and non-depressed people, anxious and non-anxious people, and people who suffer from insomnia and those who do not. Additionally, the results revealed significant statistical correlations between each of the total scores of the questionnaire and its five components as well as with the related scales. Finally, multiple regression analysis demonstrated the ability of the TCQI-R to predict depression, anxiety, and insomnia, and the prediction ratio for the overall score were 32.4%, 36.6%, and 42.6%, respectively. This indicates that worry and cognitive distraction were the most powerful strategies in dealing with insomnia. This instrument has the ability to assess and diagnose intrusive thoughts and adjust the strategies used to overcome insomnia.

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Introduction

Insomnia is defined as the difficulty in entering or maintaining sleep or waking up early because of the irregularity of one's mood and the difficulties that a person encounters in their daily life. In general, the percentage of people who suffer from insomnia range from four to 22 of people who have admitted that they suffer from insomnia (Aldahadha, 2018a). Insomnia can be perceived as a transient condition or a chronic challenge (Palagini et al., 2014; Yildirim et al., 2018a). People who suffer from sleep disorders usually attribute this to environmental events more than their personal suffering. This reasoning may cause an increase in their pre-sleep thoughts; therefore, they engage in disturbing thoughts and physical symptoms (Yildirim et al., 2018b). There are many models indicating the symptoms of insomnia, which are worry, rumination, destructive thoughts regarding sleep, selective attention to some thoughts, and behavior management strategies for sleep failure. These cognitive activities are responsible for insomnia when entering sleep (Kelly, 2002; Tang & Harvey, 2004; Yildirim et al., 2018a).

There is a significant increase in unwanted thoughts, and there is steady evidence that they are the dominant cause of a wide range of clinical disorders including depression, post-traumatic stress disorder (PTSD), obsessive-compulsive disorder, insomnia (Clark, 2005), generalized anxiety disorder, social concerns, schizophrenia, insomnia, depression, and borderline personality disorder (Coles & Heimberg, 2005; Ree, 2010; Shipherd & Beck, 1999; Tolin et al., 2007). In an attempt to control unwanted cognitive thoughts, some seek to suppress these thoughts and use various techniques to control their management and exert control, such as distraction and reappraisal, while some of these strategies had the benefit and importance. Others were not useful as the uncontrolled ideas persisted (Abramowitz et al., 2003; Harvey, 2001; Rosenthal et al., 2006; Salkovskis & Campbell, 1994). According to Schmidt et al. (2009), it is important to have consistent and authentic instruments for measuring thought control strategies (Nóbrega et al., 2020; Ree, 2010).

In a scientific attempt to evaluate the thought control strategies of a sample of psychopaths, Well and Davies (1994) developed the thought control scale, which included 30 cognitive strategies. In another study that included a patient sample, an analysis of the components of the instruments were explored, which resulted in the existence of six components. These were labelled: behavioral distraction, cognitive distraction, social control, worry, punishment, and reappraisal.

To facilitate the understanding of the role of the concepts and strategies for controlling them in sleep difficulties, Harvey (2001) modified and codified a new version of the TCQ to evaluate strategies for controlling thoughts related to insomnia. In another attempt to verify its consistency, the version from TCQ to TCQI-R was modified to become 35 items within six components, namely, aggressive suppression, cognitive distraction, behavioral distraction, social avoidance, worry, and reappraisal. Ree et al. (2005) conducted a tracer study of the validity of the modified TCQI-R scale of controlling insomnia. The results

showed the existence of six components and 43 items. A number of items were removed to become the final version of the TCQI-R scale consisting of 35 items.

The five-factor construction of the TCQ scale was reapplied in his patients' samples (Fehm & Hoyer, 2004; Reynolds & Wells, 1999). Confirmatory factor analysis was also applied in non-patient samples, and based on these results, 14 items were removed to achieve the appropriate psychometric properties. Luciano et al. (2006) conducted a study that included students, adults, and the community in general. The results of the confirmatory factor analysis demonstrated five factors as a primary construct on a TCQ, and many items were located that were not significant compared to other factors. Therefore, these results lead to the suggestion that 16 items should not be included in the components of this scale when performing the confirmatory factor analysis. Accordingly, the different models of the insomnia scale perform a major role in developing and maintaining this disorder. Insomnia symptoms particularly increase the effectiveness of the mind when attempting to go to sleep, and this is due to the presence of the cognitive ideas that affect the possibility of sleep. A statistically significant positive correlation between the measures of pre-sleep and post-sleep cognitive activity has been established by many studies (Espie, 2002; Harvey & Payne, 2002; Morin, 1993; Schmidt et al., 2009).

When reviewing the previous literature, there are suggestions that there is no factor analysis for the TCQ scale, especially for the pathological samples (Ree, 2010). There is an abundance of studies that have investigated the relationship between the thought control strategies and the mental illnesses, which are considered in the TCQ scale. This study indicated that thought control strategies are important, as they were described as helpful and relevant to some; however, it was not the same for others. For example, the punishment strategies that individuals apply as the punitive stimuli for themselves in an attempt to control their thoughts is an unhelpful strategy. An additional example is in accordance with Rassin and Diepstraten (2003) who determined that the punishment strategies correlate with mental illness ($r=0.40$) in a sample of individuals suffering from obsessive-compulsive disorder. They suggested that the punishment may be an aggravating factor in maintaining obsessive thoughts.

Strategies for controlling one's thoughts regarding anxiety and worry have been frequently determined and deemed unhelpful. For example, Coles and Heimberg (2005) compared both generalized anxiety disorder in a patient sample and a non-patient sample and determined that patients with generalized anxiety disorder had worries. This worry is positively associated with depressive symptoms and negatively related to one's life satisfaction.

In another similar study on a sample of individuals with borderline personality disorder, Rosenthal et al. (2006) noted that worry strategies correlated with the severity of the disorders and differentiated between those with borderline personality disorder and those in the control group. Specifically, the strategies of punishment and worry may be defined in regard to its association with more severe symptoms, acute psychological stress, obsessive-compulsive disorder, PTSD reactions, insomnia, trait anxiety, and depression (Abramowitz et al., 2003; Amir et al., 1997; Ree, 2010; Ree et al., 2005; Reynolds & Wells, 1999; Warda & Bryant, 1998).

With a great appreciation for the importance and the utility of the strategies for controlling one's thoughts, social control, and reappraisal; they were of great importance and were associated with low levels of mental disorders (Well & Davies, 1994). Studies have determined that these strategies help overcome psychological pressures. Consequently, cognitive re-evaluation as a strategy to challenge the validity of unwanted thoughts has been indicated as an effective strategy in reducing psychological stress as the main component of cognitive behavioral therapy. Bryant et al. (2001) established that the use of reappraisal and social control strategies increase acute stress disorder in patients after cognitive behavioral therapy, and supported for adopting these strategies in treatment. Reynolds and Wells (1999) also noted that the use of social control and distraction are associated with more positive outcomes in individuals with PTSD. Moreover, Coles and Heimberg (2005) indicated that the same patterns were beneficial in a sample of individuals with generalized anxiety compared to a control group with individuals without anxiety.

While studies demonstrate that punishment, worry, social control, and reappraisal have depicted strategies that are either effective or ineffective in controlling one's thoughts, there is ambiguity regarding whether distraction is useful as a strategy for controlling one's thoughts (Ree, 2010). Many theoretical and empirical studies have reviewed distraction and found it to be unhelpful. For example, Wegner (1994) suggested that distraction is a mediating process of the relationship between curbing one's thoughts and mental disorders.

The modified version of the TCQI-R was applied to a French sample (Schmidt et al., 2009) consisting of 298 people. The results of the previous studies on this version indicated suitable psychometric properties for adopting this questionnaire, as the internal consistency coefficient was Cronbach Alpha ranging from 74 to 79% for the aggressive suppression component. In addition, it was from 66 to 75% for behavioral distraction; 64 to 69% for cognitive distraction; 76 to 82% for reappraisal; 69 to 75% for social avoidance; and finally, 66 to 78% for worry. In another recent study of the Italian version, it was determined that there are seven thought management strategies originating from the TCQI-R and five other components that were the result of a factor analysis (Sella et al., 2016).

In summary, the TCQ scale has been re-evaluated as a useful evaluation instrument in exploring the thought control strategies on a wide range of mental disorders and in different countries and societies. It can be stated that controlling one's thoughts has many aspects. While there is an importance and a benefit to controlling one's thoughts, some studies have determined the opposite as being true and highlight the importance of these results for treating a wide range of mental disorders. However, many studies have used the TCQ scale in treating people who suffer from mental disorders, as is the case for people who have not been diagnosed with mental disorders.

This study was designed to verify the validity of the Jordanian version of the TCQI-R scale on a non-clinical sample, given the high insomnia rates, which were among the general population and due to the quarantine imposed on them due to the COVID-19 pandemic. We assume that there are a large number of respondents for this questionnaire due to the ease of sending the instruments electronically and

via various social media platforms. The scores on the study's instruments ranged between the simple symptoms of insomnia, good sleep, or the clinical symptoms of insomnia.

Method

Participants

The study's sample consisted of 361 individuals aged 19 to 61 years ($M=27.2$; $SD=11.22$), with 210 (58%) being female. Among them, 273 (75%) participants stated that they are single, 82 (23%) are married, and 6 (2%) are divorced. They were asked whether they suffer from insomnia, and 251 (70%) answered, "No" and 110 (30%) stated, "Yes." Moreover, 296 (82%) hold a bachelor's degree or higher, compared to 65 (18%) participants who had a diploma and below. All participants are Jordanians.

Instruments

The study's instruments consisted of five sections: The first section was on the demographic data, which included gender, age, marital status and whether they meant that they had insomnia or not. In addition they were asked for their academic qualifications, and they were also asked not to answer this question if their nationality was not Jordanian and/or if they did not want to participate honestly. The remaining four parts included the following study instruments:

The Pittsburgh Sleep Quality Index (PSQI)

Suleiman et al. (2010) consists of 19 self-rated questions. The items are combined to form seven component scores or subscales: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction. No scores are typically computed for the last two items that ask questions of the bed partner. For each component, scores can range from 0 to 3, with higher scores denoting poorer sleep. In addition, the seven component scores are summed to yield one total score that ranges from 0 to 21, with higher scores denoting poorer sleep quality. The revised scoring method, recommended by Beck et al. (2004), was used to compute the component scores. The total score has a cut-off of ≥ 5 that has been used to distinguish poor sleepers (≥ 5) from good sleepers (< 5 ; Buysse et al., 1989). Buysse et al. demonstrated high internal consistency reliability for the total PSQI ($\alpha=0.83$) among 148 patients with psychiatric problems. The validity of the PSQI was supported by finding significant differences between control subjects and all patient groups on the total PSQI.

Beck Depression Inventory Arab Version (BDI-ArV)

This scale is a well-known and successful measure of the level and quality of depression. Beck et al. (1996) developed it as American scientist professors at the University of Pennsylvania. Hamdi et al. (2004) translated the scale into the Arabic version. In its original form, the scale consists of 21 items. The terms of each item are arranged according to its level of intensity, ranging from its absence to its presence in varying degrees of intensity. This outcome is expressed numerically (0–3), where zero represents the lack of symptoms, while scores 1, 2, and 3 represent increasing graded levels of depression. For the purposes of this study. The total score is calculated by finding the sum of the 21 items. Score of 0–21 = low depression Score of 22–35 = moderate depression. A cut-off score of 36 and above = potentially concerning levels of depression. The validity of the Arabic version of the Beck list was verified. A sample of 56 students at the University of Jordan was divided into two groups, i.e., depressed and nondepressed groups, based on clinical interviews. Their results were statistically significant at the level ($\alpha=0.001$) in terms of distinguishing between being depressed and nondepressed. The stability of the localized list was calculated by the test–retest method on a sample of 80 male and female students at the University of.

Jordan. According to the internal consistency of the list expressed in a third sample of 635 male and female students using Cronbach's alpha, the value was 0.87 (Aldahadha, 2018b; Hamdi et al., 2004). For the purposes of this study, the list was presented to a number of reviewers, including five who hold a Ph.D. in education (two professors, two associate professors and one assistant professor), and four who hold master's degrees. All of the reviewers recommended that the Arabic list be maintained in its current form, as it is an important measure that takes into account normal individuals and psychiatric patients and is suitable to the Jordanian society who are age 13 years and above (Aldahadha, 2020).

Beck Anxiety Inventory Arab Version (BAI-ArV)

Al-Issa et al. (2000) constructed a 21-item self-report scale to assess symptoms of anxiety. Each item is answered in a Likert-like quadrature, with answers ranging from 0 to 3, where 3 indicates a high degree of symptoms of anxiety. The anxiety categories are classified into the following four categories: 0–7, low anxiety; 8–15, average anxiety; 16–25, high anxiety; and 26–63, very severe anxiety. For the purposes of this study, a cut-off score of 36 and above was adopted for those suffering from anxiety. The characteristics of the Arab version of the list have been tested in several previous Arab studies (Aldahadha, 2018b). The scale items are formulated as reported statements, and examples of items of the scale are as follows: "I feel a slight numbness in my body," "I fear bad," "I suffer from dizziness," "I feel that my heart beat accelerated." For the purposes of this study, the scale stability was also verified by the test–retest and split-half reliability methods. The stability values ranged from 0.85 to 0.93, which are suitable for the reliability of the instruments and their application to the Jordanian environment (Aldahadha, 2020).

The Insomnia Severity Index (ISI)

Suleiman and Yates (2011) is a self-answering instruments consisting of seven items that are generally used to identify insomnia in individuals and verify the severity of the problem. The respondent is asked to describe his sleep state during the past two weeks and respond to that is to the degree of satisfaction or dissatisfaction with the state of sleep during the last period (Bastien et al., 2001). The gradation of the answer on this scale from one item to the next, as the overall total varies from a low score of zero to a very large degree 28. A score of 14 and above indicates that a person suffers from insomnia. In this study, the Arabic version in which it was used was used internal consistency reliability was 0.84. The correlations between the total ISI score and the single items ranged from 0.49 to 0.92 ($p < 0.01$). In terms of convergent validity, the total ISI score showed a strong positive correlation with the Pittsburgh Sleep Quality Index total score ($r = 0.76$, $p < 0.001$) and a moderate, negative correlation with vitality ($r = -0.38$, $p = 0.026$).

Thought Control Questionnaire Insomnia-Revised (TCQI-R)

This scale is written by Ree et al. (2005) and depends on self-report; it consists of 35 items and is used to evaluate strategies used by individuals to control their thoughts while suffering from insomnia (e.g., “I let my mind go blank”). The responses to this scale vary according to the following options: Always No (1), Sometimes (2), Mostly (3), and Always (4). This questionnaire mostly consists of items expressing the strategies that assist a person in controlling their thoughts during the insomnia stage. This questionnaire also consists of a main question that initially asks: “How often does it think too much keep you awake?” This is answered on a Likert scale ranging from 0 to 10.

Procedures

Initially, the approval was obtained from the original author of the TCQI-R scale to translate the original instrument. It was in congruence with following the instructions and the laws, and ethics applicable in the scientific research. It was followed by Mutah University applying the current study. Approval was also assigned to apply to the rest of the instruments used in this study, and in another step, it was conducted by translating the instruments, which followed the same procedures as in previous studies (Aldahadha, 2020).

In an additional and advanced step, the method of thinking out aloud was used, through which the instruments were applied to 20 people of different ages and educational levels, to test whether the instruments were appropriate and whether its items were clear and comprehensible. All the participants' observations were taken into consideration, weaknesses were addressed and strengths were emphasized, and it was finally named TCQI-R (Jordanian version). Regarding the final step, a copy of

the instruments was sent through a Google Drive link. The link to the instruments was also sent via email and social media to all employees and university students. Participants were also provided with an informed consent form; they responded by marking “x” if they desired to participate. They were also informed that their data and information will be saved. The study was confidential and was only used for scientific research purposes.

Data Analysis

The means and standard deviations were determined for the group comparison, and the triple analysis of variance and the effect size were calculated. The following explanations have been relied on to explain the size of the effect (small = 0.2; medium = 0.5; and large = 0.8) (Field, 2013). Pearson coefficients were also calculated to study the relationships between the variables and analyze the general structure of the scale. Principal component analysis (PCA) was used, with oblique rotation (Direct Oblimin) and component extraction supported by parallel analysis (O'Connor, 2000). In order to explore internal consistency, Pearson correlation coefficients were calculated by applying the Cronbach Alpha equation after excluding the weak items. Finally, a multiple linear regression analysis was conducted as all these analyses were performed through IBM SPSS Statistics v.25.

Results

Structure of the TCQI-R-PCA

To study the psychometric properties of the construction of the TCQI-R scale, Ree et al. (2005) elected to use the original version. The European Portuguese version of Nóbrega et al. (2020) had also been viewed, and the possibility of constructing the (PCA) scale was initially verified. This was established through a factor analysis using the Kaiser–Meyer–Olkin (KMO) value, which was 0.90 (> 0.60) in this sample; the Bartlett's sphericity test, which proved to be statistically significant; and the pattern of correlations (r), which was mostly higher than 0.35. The necessary conditions for conducting the component analysis were verified, following which, the analysis was conducted, as seven components were located, which interpreted the value of 51% of the variance. Moreover, the presence of these seven components was not supported and accepted, according to the study by Nóbrega et al. (2020). The PCA test was used. Taking into account the limitation found, we opted for a similar analysis to the original authors and performed a PCA with Direct Oblimin rotation (since the components were expected to be related), and the components were extracted through the parallel analysis method (Field, 2013; O'Connor, 2000). Through this analysis, five components were explored, which account for 53% of the variance. These components have been grouped by adopting a saturation rate of a minimum of 40% for each item of

Table 1 Principal component analysis for the TCQI-R

	Components				
	1	2	3	4	5
<i>Reappraisal</i>					
I analyze the thought rationally	0.69				
I challenge the thoughts validity	0.53				
I try to reinterpret the thought	0.74				
I try a different way of thinking about it	0.43				
If the thoughts relate to a problem I make a decision about it in order to solve the problem	0.57				
I prefer to think things through than distract from them	0.72				
I question the reasons for having the thought	0.60				
<i>Cognitive distraction</i>					
I think pleasant thoughts instead		0.58			
I think about something else instead		0.77			
I replace the thought with a more trivial bad thought		0.49			
I call to mind positive images instead		0.43			
I let my mind go blank		0.62			
I decide to put them "on hold" until the morning		0.66			
<i>Aggressive suppression</i>					
I tell myself not to think about them now			0.68		
I say "stop" to myself			0.75		
I try to push the thoughts out of my head			0.63		
I do something physical to block them (e.g., turn over, get out of bed)			0.57		
I get angry at myself for having the thought			0.69		
I tell myself not to be so stupid			0.42		
I avoid discussing the thought			0.49		

Table 1 (continued)

	Components				
	1	2	3	4	5
<i>Worry</i>					
I focus on different negative thoughts				0.51	
I think about past worries instead				0.60	
I Worry about more minor things instead				0.74	
I tell myself that something bad will happen if I think the thought				0.60	
I shout at myself for having the thought				0.52	
I dwell on other worries				0.44	
I focus on the thought				0.67	
<i>Behavioral distraction</i>					
I keep myself busy					0.70
I try to block them out by reading a book, watching TV or listening to the radio					0.68
I do something that I enjoy					0.59
I occupy myself with work instead					0.77
I seek reassurance from others (e.g., my bed partner or a friend on the following day)					0.47

the scale. Any item where the saturation level is less than 40% or if there is a conflict of saturation between the components was deleted (see Table 1). This refers to the distribution of the scale items on its five components being similar to the original and the Portuguese version. The following names were adopted for the components: Reappraisal, cognitive distraction, aggressive suppression, worry and behavioral distraction. The “social avoidance” factor has also been excluded, while some of its items have been incorporated into the components of the different scale.

Relationship Between TCQI-R and Other Measures

The Pearson test was performed to examine the relationships between the overall score of the TCQI-R and its components with ISI, BDI-ArV, BAI-ArV, and PSQI (see Table 2), which demonstrate the values of the relationship between these measures and the overall score of the TCQI-R and its five components. The results of the computed correlations demonstrate that all the values of these correlations were indicative at the level of significance $p < 0.01$ or < 0.05 . The exceptions were the correlation between the suppression of aggression and ISI, with a value of -0.04 , and the suppression of aggression and depression, with a correlation value of -0.03 . All other values' correlations were between their functions at the level of $p < 0.01$ or 0.05 .

The Pearson test was also performed to calculate the relationship between the main question of the TCQI-R and each of the other measures used. The correlation value ranged between 47 and 59%, and all of them were significant at the level of significance 0.01 or 0.05. The Pearson test was also performed to investigate correlations between the seven components of the ISI scale and the results of each of the TCQI-R components, as indicated in Table 3. The correlation values appear to be between 0.10 and 0.59, and all correlation values were significant at the level of significance at $p < 0.01$ or < 0.05 . This was with the exception of the correlation between ISI_1c and the aggression component, and the ISI_4 factor and the aggression component, as the values were 0.07 and 0.04, respectively (Table 3).

Table 2 Associations among the TCQI-R and its components with the other variables

	Aggression suppression	Behavior distraction	Cognitive distraction	Reappraisal	Worry	TCQI-R
BDI	-0.03	0.11**	-0.04*	0.09*	0.50**	0.53**
BAI	-0.17*	-0.09*	-0.19**	0.21**	0.39**	0.42**
ISI	-0.04	0.29**	-0.31**	0.34**	0.28**	0.21**
PSQI	0.32**	0.43**	0.52*	0.19**	0.41**	0.25**

BAI-ArV Beck Anxiety Inventory Arab Version, BAI-ArV Beck Anxiety Inventory Arab Version, ISI Insomnia severity index, PSQI Pittsburgh Sleep Quality Index, * $p < 0.05$ ** $p < 0.01$

Table 3 Associations among ISI items and TCQI-R components

	Aggression suppression	Behavior distraction	Cognitive distraction	Reappraisal	Worry	TCQI-R
ISI_1a	0.11*	0.19**	0.30*	0.08*	0.31**	0.59**
ISI_1 b	0.17**	0.12*	0.29**	0.28**	0.30**	0.40**
ISI_1c	0.07	-0.10*	0.35**	0.28**	0.28**	0.40**
ISI_2	0.32**	0.23**	0.40*	0.31**	0.25**	0.39**
ISI_3	0.19*	0.31**	0.28**	0.20*	0.19**	0.30**
ISI_4	0.04	-0.18**	0.31*	0.14*	0.29**	0.41**
ISI_5	0.17*	0.22*	0.15*	0.10*	0.34**	0.52**

ISI_1a Difficulty falling asleep, ISI_1b difficulty staying asleep, ISI_1c waking up too early, ISI_2 dissatisfaction with sleep, ISI_3 interference with daytime functioning, ISI_4 impairment noticeable for others, ISI_5 worry caused by sleep problem

* $p < 0.05$ ** $p < 0.01$

The Effect of Depression, Anxiety, and Insomnia on TCQI-R and its Five Components

To verify the effect of ISI, BDI-ArV, and BAI-ArV on each of the TCQI-R and its five components, the mean and the standard deviations were calculated. The cut-off point was also adopted for the variables of ISI, BDI-ArV, and BAI-ArV. It is pertinent to note that the scales of the study's sample on the total scale of TCQR-R ranged between 34 to 128 ($M = 59.19$; $SD = 27.24$). Means and standard deviations on the total scale and its five components given the cut-off points are depicted in Table 4.

To verify the significance of the differences in these means, a triple analysis of variance was performed following each of ISI, BDI-ArV, and BAI-ArV on the total score of the TCQI-R scale and its five components. The results in Table 5 demonstrate that there are statistically significant differences on the effect of ISI, BDI-ArV, and BAI-ArV on the total score of the TCQI-R scale and its five components, at a significance level of $p < 0.05$ or 0.01. The Eta Squared value ranged between medium and low according to the Cohen's equation (Cohen, 1988). Simultaneously, the results did not demonstrate differences, which were attributed to the effect of BDI-ArV on the component of suppressing the aggression, as the value of $f = 1.59$, which is not significant.

Reliability

To verify the stability of the study's instruments, the Cronbach's Alpha coefficient and the split-half reliability method at the level of each component of the study instrument, and at the total level was extracted for internal consistency. The results demonstrated that the stability coefficients of the study's instruments for the components were between 0.78 and 0.89. At the total level, the stability coefficient reached 0.87. Moreover, the Cronbach alpha for the components ranged from 0.75–0.83, and at the total level, the reliability coefficient reached 0.90. Such values are acceptable for the

Table 4 Means and standard deviations of TCQI-R of depression (depressed and nondepressed), anxiety (anxious and non-anxious), and insomnia (insomnia –without insomnia)

Variable	Depressed N = 140		Nondepressed N = 221		Anxious N = 150		Nonanxious N = 211		Insomnia N = 124		Without Insomnia N = 237	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
TCQI-R	84.26	21.96	43.30	16.00	83.24	22.25	42.09	14.63	89.04	17.11	43.57	16.31
Aggression Suppression	20.89	7.00	11.50	5.54	20.63	7.01	11.24	5.37	21.78	6.52	11.67	5.66
Cognitive distraction	15.62	3.41	8.76	3.49	15.67	3.34	8.40	3.11	16.36	2.30	8.83	3.61
Behavior distraction	13.92	4.21	10.49	4.32	13.89	4.26	10.35	4.24	14.41	3.92	10.46	4.33
Reappraisal	19.49	5.59	11.59	5.35	19.50	5.50	11.21	5.10	20.07	5.09	11.82	5.55
Worry	19.77	5.26	9.96	3.902	19.76	5.18	9.50	3.24	20.39	4.63	10.30	4.37

Table 5 Three way analysis of variance examining the differences between depressed and nondepressed, anxious and nonanxious and insomnia and without insomnia on TCQI-R and its components

Independent variable	Dependent variable	Sum of squares	df	f	p	Eta squared
BAI-ArV	TCQI-R	2884.446	1	11.217**	.001	.030
	Aggressive suppression	55.385	1	1.593	.208	.004
	Behavioral distraction	72.716	1	4.174*	.042	.012
	Cognitive distraction	262.004	1	30.177**	.000	.078
	Reappraisal	130.215	1	4.827*	.029	.013
	Worry	130.215	1	7.995*	.005	.022
BAI-ArV	TCQI-R	6860.073	1	26.678**	.000	.070
	Aggressive suppression	316.055	1	9.092**	.003	.025
	Behavioral distraction	94.692	1	5.435*	.020	.015
	Cognitive distraction	610.606	1	70.328**	.000	.165
	Reappraisal	671.546	1	24.895**	.000	.065
	Worry	972.571	1	59.711**	.000	.143
ISI	TCQI-R	24,749.423	1	96.249**	.000	.212
	Aggressive suppression	858.272	1	24.689**	.000	.065
	Behavioral distraction	269.005	1	15.440**	.000	.041
	Cognitive distraction	596.516	1	68.705**	.000	.161
	Reappraisal	364.646	1	13.518**	.000	.036
	Worry	412.499	1	25.325**	.000	.066

BAI-ArV Beck Anxiety Inventory Arab Version, BAI-ArV Beck Anxiety Inventory Arab Version, ISI Insomnia severity index

* $p < 0.05$ ** $p < 0.01$

Table 6 Associations among the TCQI-R total scores, TCQI-R initial item, and TCQI-R components

	TCQI-R	Aggression suppression	Behavior distraction	Cognitive distraction	Reappraisal	Worry
TCQI-R	—					
Aggression	0.55**	—				
Behavior distraction	0.63**	0.50**	—			
Cognitive distraction	0.72**	0.60**	0.39**	—		
Reappraisal	0.64**	0.47**	0.17**	0.53**	—	
Worry	0.62**	0.33**	0.26**	0.47**	0.22**	—
How often does thinking too much keep you awake?	0.30**	0.28**	−0.12*	0.34**	0.29**	0.17*

* $p < 0.05$ ** $p < 0.01$

purposes of the current study. Regarding the relationship of the TCQI-R scale with its five components, the Pearson test was performed, and the main question of the scale

was added. The results demonstrated that all of these correlations were statistically significant at a significance level of $p < 0.05$ or 0.01 (see Table 6).

Multiple Regression Analysis

A multiple regression analysis was performed for the three dependent variables: ISI, BDI-ArV, and BAI-ArV, while the independent variable was the total score of the TCQI-R and its five components as per Table 7. The analysis was performed for each variable individually. The overall TCQI-R scale interpreted a rate of 32.4% for the BDI-ArV variable, and a rate of 36.6% for the BAI-ArV, while the overall score of the scale also interpreted 42.6% for the ISI variable. These values were significant at the level of $p < 0.001$. Regarding the scale components, all components presented as being significant at the prediction ratio, except for behavior distraction, as it was not indicative of any of the three dependent variables. In contrast, the ratios explained by the components of the scale varied from 11.8% as a minimum for the reappraisal component of the ISI variable to 38.8% for the worry component on the BDI-ArV variable. It is also established that the worry component had the highest percentages of the three dependent variables, compared to the other components. All of these percentages were negative, meaning that the greater the individual's ability to use the strategies to address thoughts during insomnia, the lower the symptoms of ISI, BDI-ArV, BAI-ArV, and vice versa.

Discussion

The main objective of this study is to adapt the TCQI-R scale on the Jordanian society by obtaining the validity and reliability of its data. The PCA's analysis of this scale demonstrated that there are five components: reappraisal, cognitive distraction, aggressive suppression, worry, and cognitive distraction. Previous studies indicated (Nóbrega et al., 2020; Ree et al., 2005; Schmidt et al., 2009) that there is a very high internal consistency for the components of this scale at 0.91 for the scale as a whole. They also determined that the internal consistency of the components of this scale ranged between 0.74 to 0.84 according to the Cronbach's Alpha equation. However, the structure of this scale differs from what was established in the original English version or the French version, which determined that there are six components. In this study, a few modifications were introduced from the original version, as the results of this study were more consistent with the Italian version of 2016 and the Norwegian version. This also determined that there are five components of this scale. This difference may be attributed to the specificity of the different cultures and samples, specifically as a result of the absence of a diagnosis via the clinical view of the insomnia sample in the current study. This is the case for different sample sizes and other demographic variables. The first statistical analysis of this study demonstrated that there are eight components, which explain 50% of the variance. However, due to the weak theoretical justifications for these components, a PCA analysis was performed, the results of which demonstrated that there are five

Table 7 Multiple regression analyses for TCQI-R components predicting scores on measures of ISI, anxiety and depression

Model	β	t	p	sr^2
<i>Dependent variable BDI-ArV</i>				
TCQI	-.324	-6.888**	.000	0.042
Aggressive Suppression	-.133	-2.888**	.004	0.012
Behavioral distraction	-.026	-.710	.478	0.001
Cognitive distraction	-.178	-3.341**	.001	0.019
Reappraisal	.124	2.193*	.029	0.011
Worry	-.388-	-6.009**	.000	0.025
<i>Dependent variable BAL-ArV</i>				
TCQI	-.366	-7.633**	.000	0.049
Aggressive Suppression	-.140	-2.975**	.003	0.011
Behavioral distraction	-.028	-.743	.458	0.001
Cognitive distraction	-.182	-3.338**	.001	0.013
Reappraisal	.141	2.431*	.016	0.009
Worry	-.339	-5.145**	.000	0.024
<i>Dependent variable ISI</i>				
TCQI	-.426	-10.514**	.000	0.052
Aggressive suppression	-.152	-3.826**	.000	0.012
Behavioral distraction	-.052	-1.620	.106	0.001
Cognitive distraction	-.232	-5.041**	.000	0.024
Reappraisal	.118	2.400*	.017	0.009
Worry	-.254	-4.561**	.000	0.022

* $p < 0.05$ ** $p < 0.01$

components, which explain 52% of the variance. Regarding the component of social avoidance, the results of the original version of the study by Ree et al. (2005) demonstrated a low value in its internal consistency with $\alpha=0.28$ according to the first analysis. It was excluded in the subsequent analyses.

The same results were then determined in the study conducted by Gellis and Park (2013), as they noted that the component of social avoidance did not have a valuable internal consistency, and it had a weak alpha of 0.16; thus, it was also excluded from the subsequent analyses. In this study, two items cancelled this factor from among the other components of this study, which currently has 14 items: "I kept the idea to myself" because the level of saturation was very little and it was less than 40%. The second item was [insert item here].

Regarding the distribution of the items on the components of the questionnaire, it was determined that all reappraisal component items were preserved as in the original result, items "4 16 20 24 26 29 32." In addition, the component of cognitive distraction formed from the same items as in the original results are 3 7 8 15 21 and item 22 which states, "I get upset about very simple things." In summary, the amendments made to the Norwegian version are the same as those made in the Jordanian version of this scale, with three differences: The abolition of the item, "I punish myself for thinking the thought" from the component "worry" and the transfer of the item "I worry about more minor things instead" from the component "cognitive distraction." Third, the item, "I replace the thought with a more trivial bad thought" was redirected from the component "cognitive distraction" to the component "worry." These modifications may have occurred due to adopting the cutoff point of 40% in this study, instead of 35% as per the Norwegian study. Considering that, these modifications are logical given the existence of the differences between the individuals, respondents, and different environments, and given the presence of some cultural differences and other demographic variables that distinguish individuals in this study's sample from those in other samples in previous studies.

The results of this study are in liaison with other studies (Gellis & Park, 2013; Nóbrega et al., 2020; Ree et al., 2005; Schmidt et al., 2009; Sella et al., 2016). Depending on the correlations of this questionnaire with the rest of the scales, which were high mainly on component of worry, it means that the greater the degree of worry, the greater the insomnia. The same explanation applies for depression, anxiety, and insomnia. The relationship was statistically significant for the PSQI-R scale, including all its components, except for the component "the suppression of aggression." Alternatively, the results demonstrated a statistically significant relationship between the components of the scale with the seven-item ISI. All components of the study's questionnaire, indicating that there was a correlation in most of it, was positive except for the component "the behavioral distraction," as the relationship was negative for the third and sixth components of the ISI scale. The study's results were congruent with a number of previous studies (Espie, 1991; Harvey, 2000; Lichstein & Rosenthal, 1980).

Regarding the correlations of the TCQI-R components with the overall score and its five components, the results demonstrated a statistically significant and positive relationship between all the components, including the main question in this instrument. The results indicated a strong internal consistency, that the construction of

this scale was appropriate and that the results of the correlations were statistically significant.

The results of the triple variance analysis demonstrated that there were statistically significant differences for the ISI, BDI-ArV, and BAI-ArV variables on the total score of the questionnaire for this study and its five components. This was with the exception of the component “the suppression of aggression,” with the BDI-ArV scale, where the value of $f=1.593$, was not significant. The results of all the other variables with all their components were significant at the level of $p<0.01$, with an effect size that ranged between simple or medium, according to the Cohen’s equation. Consequently, the results were significant only at the level of $p<0.05$ for each of the components of behavioral distraction and reappraisal with “depression” and the component “behavioral distraction” with “anxiety.” The interpretation of this finding can be observed by stating that the TCQI-R scale and its five components distinguish depressed individuals from nondepressed ones and anxious individuals from non-anxious ones. It also distinguishes those who suffer from insomnia from those without it (Harvey, 2001; Ree et al., 2005; Schmidt et al., 2009; Sella et al., 2016). Consequently, individuals who suffer from insomnia, depression, and anxiety lack the skills, strategies, and methods to overcome the symptoms of insomnia and do not have the sufficient ability to overcome insomnia. This requires training them in the skills and thoughts to defeat the insomnia represented by the five scale components.

The results of this study are in congruence with prior studies (Harvey, 2005; Harvey et al., 2005; Schmidt et al., 2009). Consequently, the results of the multiple regression analysis were consistent with the results of the analysis of variance, as the characteristics of the ISI, BDI-ArV, and BAI-ArV variables were changed from independent variables in the analysis of variance to dependent variables in the multiple regression analysis. The results indicated that the overall score of the TCQI-R and its five dimensions predict the percentage of depression, anxiety, and insomnia as all the t -values were statistically significant at a level of $p<0.05$ or <0.01 . The overall TCQI-R score for depression, anxiety, and insomnia was also interpreted as 32.4%, 36.6%, and 42.6%, respectively. This study predicts a greater percentage of the variable “insomnia” than “anxiety” and “depression.” The results also demonstrated that there is no statistical significance for the behavioral distraction component in predicting the variables “depression,” “anxiety,” and “insomnia,” which indicate the importance of activating the role of the other four components of “reappraisal,” “cognitive distraction,” “suppressing aggression,” and “worry” in treating the symptoms of depression, anxiety, and insomnia. The results of this study are in congruence with the study of Ree et al. (2005).

In summary, this study attempted to verify the psychometric properties of the English version of the TCQI-R questionnaire for the Jordanian community. The results demonstrated the existence of 34 items on the scale according to the PCA within five dimensions and it had a good internal consistency. This is appropriate for the purposes of this study and for good correlations with a number of measures related to symptoms of insomnia. Moreover, the results also revealed the questionnaire’s ability to distinguish between depressed and non-depressed individuals,

anxious and non-anxious individuals, and individuals who suffer from insomnia and those who do not.

Finally, the results of the questionnaire's overall score and most of its dimensions demonstrated an optimal predictor rate and an optimal effect size for the variables of depression, anxiety, and insomnia. Except for the behavioral distraction factor, the prediction values were not statistically significant. Therefore, it can be stated that individuals used the "discomfort factor," "reappraisal," "cognitive distraction," and the "suppression of aggression" components more to overcome insomnia compared to those who sleep well. Alternatively, it was determined that behavioral distraction was ineffective in overcoming the symptoms of insomnia, and it did not depict a statistically significant rate of meaning. This study recommends the importance of conducting further studies to verify the psychometric properties of the TCQI-R on disease samples and in other Arab environments. The next stage in research is to do a Confirmatory factor analysis of this scale and see if the result support the five-factor model we found. Finally, we can state that this version of TCQI-R is a suitable instrument for the Jordanian society since it has achieved optimal psychometric properties and it can be relied upon in evaluating various thought control strategies in the therapeutic sessions and in subsequent research aspects. The benefits of this questionnaire for the evaluation, diagnosis, and treatment of insomnia, particularly, go beyond the symptoms of both depression and anxiety.

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Data Availability The data used to support the findings of this study are available from the corresponding author upon request.

Declarations

Conflict of interest Author declares that he has no conflict of interest.

Ethical Approval According to the principles of the Helsinki Declaration, which includes the preservation of research ethics, there is no need to obtain official approval from any party or scientific research committee as long as the participants have the right to refuse, and they are not authorized to disclose their names or any information indicating them.

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