Assessing the measurement invariance of the CESD-10 and Beck anxiety inventory (BAI) questionnaires across people living with HIV/AIDS and healthy people

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Research article

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Abstract

Background Recently, extensive research has been reported the higher rate of depression and anxiety among people living with HIV/AIDS (PLWHAs) as compared to general population. However, no single study has been carried out to investigate whether this disparity is a real difference or it happens due to lack of measurement invariance. This study aims to assess the measurement invariance of the Beck Anxiety Inventory (BAI) and 10-item Centre for Epidemiological Studies Depression Scale (CESD-10) questionnaires across PLWHAs and healthy individuals.

Methods One hundred and fifty PLWHAs and 500 healthy individuals filled out the Persian version of the BAI and CES-D10 questionnaires. Multi-group multiple-indicators multiple-causes model (MG-MIMIC) was used to assess measurement invariance across PLWHAs and healthy people.

Results Our findings revealed that PLWHAs and healthy individuals perceived the meaning of all the items in the BAI and CESD-10 questionnaires similarly. In addition, although depression scores were significantly higher in PLWHAs as opposed to healthy individuals, no significant difference was observed in anxiety scores of these two groups.

Conclusions The current study suggests that the BAI and CESD-10 are invariant measures across PLWHAs and CESD-10 which can be used for meaningful cross-group comparison. Therefore, in comparison to healthy individuals, higher depression scores of PLWHAs is a real difference. It is highly recommended that health professionals develop therapeutic interventions and psychological supports to promote the mental health of PLWHAs which alleviate their depressive symptoms.

Background

A growing body of literature has highlighted that people living with HIV/AIDS (PLWHA) experience a wide variety of distressing events such as complicated therapeutic regimes, disease exacerbation, shortened life expectancy, presence of pain, poor social and family support, financial burden and impoverishment as well as fear of disclosure and stigma (1–8). Accordingly, it is not surprising that depression and anxiety are highly prevalent among PLWHAs (2, 9–17). Diagnosing and treating depression and anxiety in PLWHAs has received special attention in the past decade since underdiagnosed and undertreated these psychological disorders usher in lower quality of life, poor adherence to HIV medications, faster disease progression, reduction of CD4 counts, deterioration in immunological function, suicidal ideation, greater sexual risk behaviors and marital conflict (10, 11, 13, 14, 18–26). In general, the prevalence rate of depression and anxiety has been estimated from 3.2–45% and from 1.27–53% among PLWHAs, respectively. (2, 9, 12, 27, 28). This diversity in prevalence rates can be contributed to various patients in different studies, research settings and more importantly the methods and criteria used for the assessment and diagnosis of depression and anxiety.

To diagnose depression and anxiety in clinical and research settings the most common method is using self-administrated questionnaires. In recent years, a number of self-reported questionnaires have been

introduced to assess these two psychological disorders in PLWHAs (29–33). The main important point in applying these questionnaires overlooked in previous studies is that some symptoms of depression/anxiety such as fatigue and sleep difficulties which is measured by the items of the questionnaires are trans-diagnosed with neurological conditions or the side effects of medications (13, 34). This issue may obscure the segregation of their origin (13). Therefore, from the viewpoint of measurement, it is critical to assess an important assumption of measurement invariance. Measurement invariance means that different respondents from different groups perceive the meaning of the items in a given questionnaire similarly (35). If PLWHAs and other subpopulations specifically healthy people perceive the meaning of the items of studied questionnaires in the same way, it can be concluded that this trans-diagnosis cannot be occurred (34). Furthermore, if measurement invariance is established, we can deduce that the differences in prevalence rates as well as scores of depression and anxiety between PLWHAs and general population is real difference and it is not due to an artificial effect of different interpretation of the items by the members of these two groups. Although some studies have been carried out to investigate the measurement invariance of depression/anxiety questionnaires across various patient groups such as breast cancer, migration, neurologic patients, and healthy population (34, 36, 37), to the best of our knowledge, no study has been conducted to examine the measurement invariance of these questionnaires across PLWHAs and healthy population. To fill this gap, this study aims to evaluate the measurement invariance of the Beck Anxiety Inventory (BAI) and 10-item Centre for Epidemiological Studies Depression Scale (CESD-10) instruments across PLWHAs and general population.

Methods

Participants

All PLWHAs who referred to a voluntary counselling and testing (VCT) centre for preventive and medical care services, were invited to the study between February and June 2015 in Shiraz (Sothern Iran). During the study period, 150 individuals who provided informed consent form participated in the study. Patients who could read and write were included to the study; while those with neurocognitive impairment were excluded. We collected some socio-demographic characteristics such as age, gender, job status, and education. In order to assess depression and anxiety of the patients, the Persian version of the CESD-10 and BAI questionnaires were used, respectively.

Furthermore, the random sample of 500 healthy individuals were selected based on a two-stage cluster sampling technique across four educational districts located in diverse socioeconomic areas in the city of Shiraz. The data was collected from September to December 2015. In the first stage, a random sample of schools was selected from each educational district. Then, we selected one or two classes out of each school. A trained researcher distributed the CESD-10, BAI instruments, and the informed consent form to all students and asked them to give the questionnaires to their parents. Approximately 70% (500 out of 700) of parents filled out the questionnaires at home after signing the informed consent form. In a couple of days, the completed questionnaires were turned back to school by children.

Instruments

Beck Anxiety Inventory (BAI): The Persian version of the BAI questionnaire was used to measure both PLWHAs' and healthy individuals' anxiety. The BAI is a self-report questionnaire that can reliably discriminate anxiety from depression. It comprises 21 anxiety symptoms that bothered the participants during their last week. Individuals responded to the items on a 4-point Likert scale (from 0= not at all to 3= severely, I could barely stand it). The total score is the sum of the individual scores of the items ranging from 0 to 63, with a higher score showing greater anxiety (38). The instrument was translated and validated previously in Persian (39). The main reasons for selecting the BAI are its simplicity, briefness and widely use in clinical research.

10-item Centre for Epidemiological Studies-Depression Scale (CESD-10): To measure the depression status of PLWHAs and healthy individuals, the Persian version of the CESD-10 which had been validated in Iran (40) was applied. According to previous research, this questionnaire is suitable to assess depression among PLWHAs. It is a short, easy to read and easy to score instrument which can reduce interview burden on the patients (33). Moreover, it has been widely used for assessing depression symptoms in general population. The items are scored on a 4-point Likert scale from 0 (not at all) to 3 (a lot). Total score is the sum of items score and the possible range is 0 to 30. The higher the total score, the greater is the degree of depressive symptoms.

Statistical analysis

The qualitative and quantitative variables were presented in frequency (percentage) and mean± standard deviation, respectively. In addition, two-sided independent sample t-test and Chi-square statistics were applied to investigate whether PLWHAs and healthy people differed significantly in terms of quantitative and qualitative demographic characteristics, respectively. P value<0.05 was considered as significance level.

The measurement invariance of a questionnaire is evaluated by differential item functioning (DIF) analysis. DIF occurs when people from different groups respond differently to a particular item given the same level of latent trait of interest. Two types of DIF can be identified, namely uniform and non-uniform DIF (35). Uniform DIF means that on the entire continuum of the latent trait, item response probabilities are higher (lower) in one group compared to the other one. In contrast, in non-uniform DIF, the direction of DIF is different in different levels of latent trait (35).

In the present study, the multi-group multiple-indicators multiple-causes model (MG-MIMIC) model, which is an extension of the MG-CFA model with covariates, was used to assess the measurement invariance (i.e., DIF) of the BAI and CESD-10 instruments across PLWHAs and healthy individuals. In this model, uniform DIF is detected when discrepancy is observed in the thresholds of a given item across the groups and non-uniform DIF is identified when the factor loading of an item differs between the groups. A distinguished advantage of this method is that the effect of confounding variables can be controlled while assessing DIF. Consequently, in this study, the effect of age, gender and education which differed

significantly between PLWHAs and healthy individuals were taken into account while examining DIF. In the MG-MIMIC model, DIF detection process is iterative and also consists of serial tests of nested models. In the first step, the most constraint model in which the factor loadings, thresholds, residual variance, latent trait variance and scaling factor considered invariant in both groups fit as baseline model. If the model fits adequately, measurement invariance is established or there is no item with DIF; however, if the model does not fit well it may be an indication of DIF (41, 42). In this case, the values of modification indices specify which item can be a candidate for DIF. If the modification index associated with thresholds of an item is larger than the others, this item is a candidate for uniform DIF. If the modification index associated with factor loadings of an item is large, this may be an indication of non-uniform DIF item.

In the second step, equality constraint on the factor loading of the item with the largest magnitude of the modification index is relaxed. This new model is fitted and compared to the baseline model. Simultaneously, the equality constraint on the factor loading and thresholds of the item with the largest magnitude of modification index is relaxed and the model is fitted and compared to the baseline model. If relaxing of factor loading parameter leads to larger improvement of the model, non-uniform DIF is detected; while, if relaxing of thresholds parameter results in larger improvement, uniform DIF is detected. The resultant model is considered as the new baseline model with the values of modification indices being examined again and all the steps mentioned above are repeated until no significant model modification is identified. In order to assess the goodness of fit of the MG-MIMIC models several indices were used including Chi-square statistics, root mean square error of approximation (RMSEA), Tucker-Lewis index (TLI), and comparative fit index (CFI). Although non-significant values of Chi-square shows acceptable model fit, this index detects even trivial differences under large sample size. Hence, the other above-mentioned fit indices should also be considered for testing goodness of fit of the model. Values of CFI and TLI > 0.90, and RMSEA < 0.08 support that the model fit well (43). In the present study, the mean and variance-adjusted weighted least square (WLSMV) estimation procedure which has been introduced for ordinal indicators was applied to fit the MG-MIMIC model using Mplus 6.1 software.

Results

Table 1 shows the summary statistics for demographic characteristics of the PLWHAs and healthy individuals. The mean age of healthy people (42.67 ± 6.78) was significantly greater than that of PLWHAs (39.68 ± 7.92). Although in healthy population the number of male and female was approximately equal (50.6% vs 49.4%), the number of male patients was significantly higher than that of female (64% vs. 36%). In addition, the number of individuals with above diploma-level education was significantly higher among healthy population as compared to the PLWHAs (92.6% vs. 7.4%). However, there was no significant differences between healthy population and PLWHAs in terms of employment status.

Table 2 shows the results of the MG-MIMIC model including the factor loading and thresholds of the items in the CESD-10 questionnaire across PLWHAs and healthy people. As indicated the factor loadings and thresholds of all the items were equal between PLWHAs and healthy individuals which implies that

there was no DIF item across the groups and measurement invariance of the CESD-10 was established. The values of fit indices (RMSEA = 0.069, CFI = 0.94, and TLI = 0.94) also confirmed that the most constraint model fit well to the data.

Table 3 represents the estimated factor loadings and thresholds of the BAI's items resulting from the MG-MIMIC model for assessing DIF across PLWHAs and healthy individuals. As shown the values of factor loadings and thresholds of all the items were the same across the groups. This means that no DIF item was detected and BAI is an invariant questionnaire across PLWHAs and healthy individuals. In addition, the values of fit indices supported the fit of the most constraint model (RMSEA = 0.064, CFI = 0.95, and TLI = 0.96).

Table 4 represents the depression and anxiety scores (mean ± SD) of PLWHAs and healthy individuals. Although the anxiety scores did not differ significantly between these two groups, the depression scores of PLWHAs were significantly higher than those of healthy individuals.

Discussion

The current study investigated the measurement invariance of CESD-10 and BAI across PLWHAs and healthy individuals, the issue which has never been investigated in the previous studies. Our findings provide evidence that the measurement invariance for valid comparison across healthy individuals and PLWHAs has been satisfied for the CESD-10 and BAI questionnaires. This implies that the PLWHAs and healthy individuals perceived the meaning of the items in CESD-10 and BAI questionnaires similarly and the symptoms of depression and anxiety were not trans-diagnosed with neurological conditions or the side effects of medications.

Previous studies assessing the measurement invariance of several depression and anxiety questionnaires across healthy individuals and patients with different chronic conditions have reached conflicting results. In accordance with the results of the present study, some previous research has demonstrated the measurement invariance of CESD, PHQ-9, PROMISD-8, K6 and GDS-15 across community sample and patients with neurologic, cognitive as well as arthritis problems (34, 44–46). In contrast, Broekman et al. (2008) detected some items with DIF in GDS-15 questionnaire across healthy individuals and people with chronic illness (47). In addition, in a study which examined the measurement invariance of the PHQ-9 across healthy individuals and patients with breast, lung and colorectal cancer two items with DIF were identified. Waller et al. (2005) also reported differential item functioning of Beck Depression Inventory questionnaire across women with breast cancers and women with major depression disorder (48). Furthermore, it has been shown that Short Health Anxiety Inventory questionnaire was not an invariant measure across healthy individuals and patients with diabetes, breast cancer along with multiple sclerosis (36). These contradictory results may be due to different questionnaires which have been applied in different studies as well as various kinds of health conditions studied in previous research.

We also found that depression scores were significantly higher among PLWHAs as compared to healthy individuals. This result supports previous studies (1, 2, 49). According to the proceeding research, stigma, poor family relations, limited psychological support and lower socioeconomic status may explain the increased risk of depression in PLWHAs (1, 2, 21, 50–51).

Contrary to our expectations, this study showed that no significant difference was observed in anxiety scores of PLWHAs and healthy individuals. Although this result differs from some published studies which reported that anxiety was higher in PLWHAs as opposed to general population (1–3, 6, 14, 49), it is consistent with other studies such as Prasithsirikul et al. (2017) and Sewell et al. (2000) (28, 52). These contradictions in the results could be attributed to a variety of populations and instruments applied in different studies to ascertain the diagnosis of psychological disorders. One possible explanation for our findings might be that the mean duration of living with HIV in our sample was 5.52 ± 3.43 which is somehow a lengthy period in which PLWHAs have acquired skills to adapt to living with HIV so that they may no longer be afraid of dying from HIV (28, 52).

The key strength of the current study is that the effects of age, gender and education as confounding variables were taken into account when assessing DIF. The importance of this issue is due to the fact that without controlling confounding variables, the detection of an item with DIF may distort due to inherent differences in the magnitude of these variables between the two groups (41).

This study has some limitations that merit attention when interpreting the results. First, the sample of patients was gender-imbalance as the majority of PLWHAs was male. The result would be different if we match PLWHAs and healthy individuals in terms of their gender. Moreover, the results of DIF may differ from one questionnaire to another; therefore, further investigations should be conducted to assess the measurement invariance of other depression and anxiety questionnaires. Different results would also be achieved if we assess DIF among participants with other cultures, nationalities or health conditions which can be an important issue for further research.

Conclusions

In conclusion, the findings of this study suggest that the BAI and CESD-10 questionnaires can be considered as invariant measures across PLWHAs and healthy individuals, at least in our sample. More importantly, the measurement invariance of the questionnaires may ensure us that the higher depression scores of PLWHAs in comparison to healthy individuals is a real difference. It is highly recommended that health professionals develop therapeutic interventions and psychological supports to promote the mental health of PLWHAs that alleviate their depression symptoms.

Abbreviations

BAI: Beck Anxiety Inventory

CESD-10: 10-item Centre for Epidemiological Studies Depression Scale

PLWHA: people living with HIV/AIDS

MG-MIMIC: Multi-group multiple-indicator multiple-causes

VCT: Voluntary counselling and testing centre

DIF: Differential item functioning

RMSEA: Root mean square error of approximation

TLI: Tucker-Lewis index

CFI: Comparative fit index

WLSMV: Mean and variance-adjusted weighted least square

Declarations

Ethics approval and consent to participate: All procedures performed in studies involving human participants were in accordance with the ethical standards of the ethical and research committee of our institution, Shiraz University of Medical Sciences. Informed consent form was obtained from all individual participants included in the study.

Availability of data and materials: The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests

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Authors' contributions: ZB designed the study, analyzed the data, interpreted the results and wrote the manuscript. **PN** collected and analyzed the data, and wrote some parts of the manuscript. **ZSH** wrote some parts of the manuscript and edited the manuscript in terms of English language. **PJ** designed the study, analyzed the data, interpreted the results and wrote the manuscript. All authors read and approved the final manuscript.

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Tables

Table 1: Demographic characteristics of PLWHAs and healthy individuals

Variable	PLWHA	healthy	
	Mean±SD	Mean±SD	P-value¶
Age	39.68±7.92	42.67±6.78	<0.001
	Number(%)	Number(%)	P-value*
Sex			
Male	96(64)	253(50.6)	<0.001
Female	54(36)	247(49.4)	
Education			
Under diploma	11(7.4)	130(27.6)	<0.001
Above diploma	137(92.6)	431(72.4)	
Job			
Employed	60(43.8)	184(40.8)	0.533
Unemployed	77(56.2)	267(59.2)	

*p-value based on Chi-square statistics
¶ P-value based on independent samples t-test

Table 2 Item parameters and standard errors for the items in the CESD-10 questionnaire across PLWHAs and healthy population

		Factor loading	1^{st} threshold	2^{nd}threshold	3^{rd} threshold
		b(SE)	τ_1(SE)	τ_2(SE)	τ_3 (SE)
q1: I was bothered by things that usually don't bother me	healthy	0.870 (0.077)	-1.111(0.470)	0.007(0.469)	0.888(0.473)
	PLWHA	0.870 (0.077)	-1.111(0.470)	0.007(0.469)	0.888(0.473)
q2: I had trouble keeping my mind on what I was doing	healthy	0.841(0.073)	-0.849(0.494)	0.435(0.492)	1.072(0.508)
	PLWHA	0.841(0.073)	-0.849(0.494)	0.435(0.492)	1.072(0.508)
q3: I felt depressed	healthy	1.492(0.124)	-2.447(0.678)	-1.094(0.668)	-0.004(0.668)
	PLWHA	1.492(0.124)	-2.447(0.678)	-1.094(0.668)	-0.004(0.668)
q4: I felt that everything I did was an effort	healthy	-0.268(0.049)	-0.246(0.331)	0.382(0.330)	1.025(0.334)
	PLWHA	-0.268(0.049)	-0.246(0.331)	0.382(0.330)	1.025(0.334)
q5: I felt hopeful about the future	healthy	0.654(0.062)	-1.190(0.398)	-0.469(0.396)	0.115(0.399)
	PLWHA	0.654(0.062)	-1.190(0.398)	-0.469(0.396)	0.115(0.399)
q6: I felt fearful	healthy	1.036(0.087)	-1.354(0.539)	-0.320(0.537)	0.535(0.539)
	PLWHA	1.036(0.087)	-1.354(0.539)	-0.320(0.537)	0.535(0.539)
q7: My sleep was restless	healthy	1.006(0.080)	-0.443(0.522)	0.610(0.523)	1.488(0.538)
	PLWHA	1.006(0.080)	-0.443(0.522)	0.610(0.523)	1.488(0.538)
q8: I was happy	healthy	0.824(0.066)	-1.887(0.408)	-0.741(0.403)	0.298(0.404)
	PLWHA	0.824(0.066)	-1.887(0.408)	-0.741(0.403)	0.298(0.404)
q9: I felt lonely	healthy	1.092(0.088)	-1.521(0.523)	-0.435(0.520)	0.505(0.526)
	PLWHA	1.092(0.088)	-1.521(0.523)	-0.435(0.520)	0.505(0.526)
q10: I could not "get going"	healthy	1.264(0.116)	-1.192(0.592)	-0.266(0.593)	0.648(0.600)
	PLWHA	1.264(0.116)	-1.192(0.592)	-0.266(0.593)	0.648(0.600)

b: factor loading, τ_i: threshold parameters, SE: standard error

Table 3 Item parameters and standard errors for the items in the BAI questionnaire across PLWHAs and healthy general population

		Factor loading	1st threshold	2ndthreshold	3rd threshold
		b(SE)	τ_1(SE)	τ_2(SE)	τ_3 (SE)
q1: Numbness or tingling	healthy	0.887(0.072)	0.442(0.481)	1.615(0.479)	2.846(0.518)
	PLWHA	0.887(0.072)	0.442(0.481)	1.615(0.479)	2.846(0.518)
q2: Feeling hot	healthy	0.797(0.061)	0.024(0.441)	0.922(0.443)	2.387(0.446)
	PLWHA	0.797(0.061)	0.024(0.441)	0.922(0.443)	2.387(0.446)
q3: Wobbliness in legs	healthy	1.089 (0.095)	0.277(0.630)	1.025(0.634)	2.222(0.666)
	PLWHA	1.089 (0.095)	0.277(0.630)	1.025(0.634)	2.222(0.666)
q4: Unable to relax	healthy	1.115 (0.077)	-0.521(0.550)	0.818(0.554)	2.083(0.570)
	PLWHA	1.115 (0.077)	-0.521(0.550)	0.818(0.554)	2.083(0.570)
q5: Fear of worst happening	healthy	0.891(0.060) 0.060) 0.060	-0.519(0.473)	0.459(0.476)	1.822(0.490(
	PLWHA	0.891(0.060)	-0.519(0.473)	0.459(0.476)	1.822(0.490(
q6: Dizzy or lightheaded	healthy	1.163(0.086)	-0.927(0.671)	0.126(0.678)	1.588(0.731)
	PLWHA	1.163(0.086)	-0.927(0.671)	0.126(0.678)	1.588(0.731)
q7: Heart pounding/racing	healthy	1.071(0.075)	0.430(0.583)	1.550(0.587)	2.716(0.598)
	PLWHA	1.071(0.075)	0.430(0.583)	1.550(0.587)	2.716(0.598)
q8: Unsteady	healthy	1.130(0.091)	0.642(0.587)	1.888(0.579)	2.957(0.629)
	PLWHA	1.130(0.091)	0.642(0.587)	1.888(0.579)	2.957(0.629)
q9: Terrified or afraid	healthy	1.105(0.087)	0.463(0.628)	1.410(0.619)	2.869(0.706)
	PLWHA	1.105(0.087)	0.463(0.628)	1.410(0.619)	2.869(0.706)
q10: Nervous	healthy	0.914(0.060)	-1.039(0.482)	0.064(0.481)	1.698(0.496)
	PLWHA	0.914(0.060)	-1.039(0.482)	0.064(0.481)	1.698(0.496)
q11: Feeling of choking	healthy	1.251(0.132)	0.151(0.812)	1.135(0.806)	2.233(0.865)
	PLWHA	1.251(0.132)	0.151(0.812)	1.135(0.806)	2.233(0.865)
q12: Hands trembling	healthy	0.985(0.084)	-0.153(0.572)	0.748(0.571)	2.089(0.646)
	PLWHA	0.985(0.084)	-0.153(0.572)	0.748(0.571)	2.089(0.646)
q13: Shaky/unsteady	healthy	1.360(0.144)	-0.163(0.801)) (0.084)	0.913(0.797)	2.119(0.896)
	PLWHA	1.360(0.144)	-0.163(0.801)) (0.084)	0.913(0.797)	2.119(0.896)
q14: Fear of losing control	healthy	0.868(0.072)	-1.155(0.536)	-0.044(0.525)	1.263(0.592)
	PLWHA	0.868(0.072)	-1.155(0.536)	-0.044(0.525)	1.263(0.592)

q15: Difficulty in breathing	healthy	1.161(0.115)	0.227(0.852)	1.429(0.841)	2.436 (0.900)
	PLWHA	1.161(0.115)	0.227(0.852)	1.429(0.841)	2.436 (0.900)
q16: Fear of dying	healthy	0.539(0.058)	-0.698(0.411)	-0.068(0.406)	0.838(0.414)
	PLWHA	0.539(0.058)	-0.698(0.411)	-0.068(0.406)	0.838(0.414)
q17: Scared	healthy	0.854(0.071)	-0.262(0.514) (0.411)	0.849(0.508)	1.917(0.537)
	PLWHA	0.854(0.071)	-0.262(0.514) (0.411)	0.849(0.508)	1.917(0.537)
q18: Indigestion	healthy	0.800(0.069)	0.421(0.498)	1.339(0.496)	2.359(0.529)
	PLWHA	0.800(0.069)	0.421(0.498)	1.339(0.496)	2.359(0.529)
q19: Faint/lightheaded	healthy	1.557(1.262)	1.740(1.280(	1.470(1.212) 143.472	2.853(2.245)
	PLWHA	1.557(1.262)	1.740(1.280(	1.470(1.212) 143.472	2.853(2.245)
q20: Face flushed	healthy	0.626(0.064)	1.290(0.508)	2.208(0.514)	2.986(0.520)
	PLWHA	0.626(0.064)	1.290(0.508)	2.208(0.514)	2.986(0.520)
q21: Hot/ cold sweats	healthy	0.785(0.066)	0.577(0.463)	1.329(0.463)	2.573(0.470)
	PLWHA	0.785(0.066)	0.577(0.463)	1.329(0.463)	2.573(0.470)

b: factor loading, τ_i: threshold parameters, SE: standard error

Table 4: Comparison of depression and anxiety scores between PLWHAs and healthy individuals

Variable	PLWHA	healthy	
	Mean±SD	Mean±SD	P-value¶
Depression	10.45±5.56	7.16±4.95	<0.001
Anxiety	8.34±8.02	8.36±8.12	0.974

¶ P-value based on independent samples t-test