

Reliability, Validity, and Psychometric Properties of the Persian Version of the Tayside Children's Sleep Questionnaire

Farid Rajaee Rizi

Kashan University of Medical Sciences

Fatemeh Sadat Asgarian (✉ fatisadat@yahoo.com)

Kashan University of Medical Sciences

Research Article

Keywords: Reproducibility of Results, Sleep-Wake Disorders, Surveys and Questionnaires

Posted Date: January 10th, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1203683/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background: Tayside children's sleep questionnaire (TCSQ) is a simple tool for screening the Disorders of Initiating and Maintaining Sleep among children aged between one and five years. In this study, we aimed to translate TCSQ into Persian and evaluate the validity and reliability of TCSQ among Persian speakers.

Methods: A cross-sectional study was conducted among 311 children aged 1-5 years in Isfahan. After permission, the forward-backward translation method is used to develop the Persian version. Finally, 311 children participated in this survey, and 30 were repeated for a second time. Google Form, SPSS16, and STATA14 were used for data collection, descriptive statics, and factor analysis. BEARS questionnaire is used for convergent validity. Three expert opinions were used for content validity.

Results: In this study, 404 mothers of children in Isfahan volunteered to participate in the survey, of which 311 remained. The mean and standard deviation age of their children was 3.47 ± 1.91 years. Cronbach Alpha of the Persian version of TCSQ was 0.76 CI (0.78-0.66). The intra-class correlation coefficient was 0.67 CI (0.60-0.74). The content validity index was 0.88, and three factors (Disturbance, nighttime, parents) with a specific value greater than 0.4 is determined by factor analysis.

Conclusions: The current study results indicate that TCSQ has good reliability and validity among Persian speakers.

Background

Children who get enough sleep have better performance during the day [1]. Sleep is an active physiological phase of the circadian cycle that plays an essential role in various physiological aspects of childhood development [2]. The role of insomnia in obesity, learning disabilities, cognitive disorders, and behavioral disorders in childhood is not hidden from us [3-6].

Hypersomnia, insomnia, narcolepsy, parasomnia, respiratory disorders during sleep are examples of sleep disorders considered in classifications [7]. Sleep disorders are classified into two major classifications of the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-V) and International Classification of Sleep Disorders third edition (ICSD3) [7]. According to ICSD3, various sleep disorders can be classified into six major groups: Insomnia, Sleep-Related Breathing Disorders, Central Disorders of Hypersomnolence, Sleep-Wake Disorders, Parasomnias, Sleep-Related Movement Disorders [8].

In DSM-IV, the Disorders of Initiating and Maintaining Sleep (DIMS) or non-restorative sleep lasted for at least one month is considered a class of sleep disorders in DSM-V; the last available version, this class has been changed. The duration changed from one month to three months, and disorder in initiating, maintaining, and inability to return to sleep after Early-morning awakening are considered criteria for quantity or quality sleep dissatisfaction [9].

There are several methods for assessing sleep disorders [10]. Today, there are advanced diagnostic methods such as polysomnography [11]. Polysomnography provides vast and accurate information about the patient's sleep, such as body movements, breathing patterns, sleep stages, EEG, heart rate. These advanced methods have limited indications because of different reasons. Perhaps one of the most important reasons is that these tests are not available in many areas. In addition, in many cases, they are not needed and increase costs [12].

Therefore, the diagnosis in most cases is based on taking a good medical history. Some sleep disorders, such as sleep apnea, may not be known to the patient [13]. It is essential to take the medical history from the patient and the patient's companions. In early childhood, the diagnosis is often based on information provided by the patient's mother [14].

A simple and widely used tool for screening and conducting research on sleep disorders is a questionnaire [12, 15]. Different questionnaires have been developed to assess sleep disorders. Each of these has specific applications, and each age group has a questionnaire [16]. They can also be used as a screening method to assess sleep disorders in primary health care centers [17].

Tayside Children's Sleep Questionnaire (TCSQ) is a simple sleep questionnaire developed by McGreavey et al. in ten questions to assess DIMS among children aged between one and five years during the last three months ago. This questionnaire can be used for research purposes or as a screening tool in clinical practice [18]. In 2020, the Korean version of TCSQ was developed by Yesol et al. [19].

As mentioned above, DIMS was a class of sleep disorders in DSM-IV, which has minor changes in DSM-V. However, TCSQ is still usable for screening disorders in initiating and maintaining sleep among children [19].

This study aims to translate the TCSQ into Persian and evaluate the reliability and validity of the Persian version of the Tayside Children's Sleep Questionnaire (P-TCSQ) among Iranian preschoolers as a screening tool to assess sleep disorders in initiating and maintaining sleep in a period of last three month in children aged between one and five years old.

Methods

This study is a cross-sectional study. In this study, 311 mothers of children aged 1-5 years in Isfahan were randomly selected. First, the goals of this study were explained to mothers. Four hundred four mothers engaged in this study. We asked about the history of psychiatric illnesses in mothers. Almost 14% of the mothers with at least one psychiatric disorder like obsessive-compulsive disorder or stress spectrum disorder were excluded. Then, we asked about the clinical history of their children. All children with critical medical conditions like CNS abnormalities were excluded. Also, incomplete answers were omitted. Finally, a crowd of 311 children remained in this study. Two weeks later, a group of 30 participants answered the questionnaires for the second time.

Translation

We used forward-backward translation and the pre-test. In this way, the English version of TCSQ was translated into Persian by two people who were proficient in translating medical texts and with experience in translating questionnaires. Then the translations were compared, the questions were matched in terms of meaning and concept, and a Persian version of this tool was finally prepared by selecting the best options. Then, to ensure that the Persian translation matches the original text and the sentences are clear, the translated version was translated into the original language by two other fluent English translators who had not seen the initial questionnaire before.

Sample Size

Psychometric instructions suggest 8 to 12 samples for each question [20]. We selected 404 Iranian children between the ages of 1 and 5.

Material

Tayside Children's Sleep Questionnaire (TCSQ)

As mentioned, TCSQ is a 10-item questionnaire to assess DIMS in children one to five years old. The first version was developed in 2005 by McGreavey et al. with Cronbach's alpha of 0.85. The scoring of this questionnaire is in the form of Likert. The first nine questions score from zero to four. The last question is considered separately [18].

BEARS questionnaire

The psychometric properties of the Persian version have been approved by Mohammadi et al., and the Cronbach's alpha was more than 0.8. This questionnaire consists of two parts. One section is used for children two to six years old, and the other one is used for children seven to 12 years old. In this study, we used the first part of this test. If the mother puts a positive sign in front of questions, it indicates that a sleep disorder exists in her child. In this study, we used this questionnaire to assess convergent validity [21].

Inclusion criteria

Children aged between one and five years old Who live with both biological parents are included in this survey.

Exclusion Criteria

Mothers declare that they had any psychiatric disorder, or their Children with any history of certain medical conditions three months ago or who lost their parent(s) during the study are excluded.

Test-retest reliability

We used the internal consistency coefficient known as Cronbach's alpha to calculate the P-TCSQ internal reliability. Intra-class correlation coefficient (ICC) was also calculated by repeating the survey on 30 mothers after 2-4 weeks [22].

Validity:

Face Validity:

The opinions of three experts about the clarity, simplicity, and eloquence of P-TCSQ were asked.

Content Validity:

The questionnaire was given to three experts to determine whether the measured elements can measure the concept and whether the questions used in the questionnaire represent the whole questions or not.

Convergence validity

We used the BEARS sleep questionnaire to assess the convergent validity between TCSQ and BEARS.

Exploratory Factor Analysis (EFA)

For construct validity, Exploratory Factor Analysis (EFA) is used with Varimax rotation. Also, to evaluate the suitability of the data for factor analysis, two preliminary tests of sampling adequacy, KMO and Bartlett's Test at $P < .0001$ level, were used. For analyzing the relevant factor in sampling adequacy, a score of 0.6 and above was considered.

Statistical analysis

We extracted data from Google Form and imported it into Excel. Then, using the "replace" tool, answers are converted to the Likert scale according to the guideline of TCSQ. Then we used STATA 14th version for factor analysis and SPSS 16th version for descriptive statistics. Cronbach's alpha is calculated for the internal consistency of TCSQ. Test-retest reliability, confirmed by Intra-class coefficient (ICC). Spearman correlation coefficient and EFA are used to perform factor analysis.

Results

In this study, questionnaires were distributed among 404 mothers of children in Isfahan who volunteered to participate in the study. Three hundred eleven of them who completed the questionnaire remained, but 93 questionnaires were discarded. Their children's mean and standard deviation age was 3.47 ± 1.91 years, with a minimum age of one and a maximum of five. Among 311 children, 164 were boys (52.7%), and 147 were girls (47.3) (Table 1).

Table 1 *Frequency and percentages of children*

Variable		N (%)
Gender	Male	164 (52.73)
	Female	147 (47.26)
Age($\bar{x}\pm SD$)		3.47 \pm 1.91
Mother's educational level	primary school	7 (2.25)
	middle school	10 (3.21)
	high school	12 (3.85)
	Diploma	90 (28.93)
	Associate	27 (8.67)
	Bachelor	120 (38.58)
	Master	42 (13.50)
	doc/PhD	2 (0.64)
	Postdoc	1 (0.32)

The mean and standard deviation of the overall score of the questionnaire was 14.64 ± 6.9 . The mean and standard deviation of the domains are also according to Table 2.

Table 2 Mean and standard deviation of the domains

Domain	N	Minimum	Maximum	Mean	Std. Deviation
Disturbance	311	.00	20.00	7.73	4.23
Nighttime	311	.00	16.00	5.13	3.87
Parents	311	1.00	2.00	1.78	0.41
TCSQ	311	1.00	37.00	14.64	6.89
Valid N (listwise)	311				

Cronbach's alpha coefficient for the total reliability of the questionnaire was equal to 0.76 CI (0.78-0.66), and by removing each of the items, no significant change in Cronbach's alpha was observed. In other words, people had almost the same perception of the tool. The intra-class correlation index (ICC coefficient) was calculated to estimate the reliability of the instrument. The intra-class correlation index (ICC coefficient) was 0.67 CI(.60-.74), which confirms the repeatability of this test.

Face validity

No ambiguity was reported in the questionnaire questions by examining face validity.

Content validity

The average content validity (CVR-Save) based on the opinion of 3 experts as an estimate of CVI was 0.88, and the minimum and maximum CVR was between 0.73 to 0.94.

Convergence validity

The correlation coefficient between Tayside and BEARS questionnaires was calculated using the Spearman correlation coefficient. The correlation coefficient between the two scales ($r = 0.277$ and $p=0.00$) was calculated, which is significant at the level of $P < 0.01$.

For construct validity, exploratory factor analysis was used. The KMO value is 0.723, and the level of significance of Bartlett's Test of Sphericity is less than 0.001.

Table 3 *KMO and Bartlett's Test*

TEST	Results
KMO Measure of Sampling Adequacy.	0.72
Bartlett's Test of Sphericity	Approx. Chi-Square 534.89
	Df 45
	Sig. 0.00

Therefore, based on both criteria, it can be concluded that the implementation of factor analysis based on the correlation matrix in the sample groups can be justified, and the data are suitable for exploratory factor analysis. Table4

Table 4 *Component Matrix*

TCSQ question	Component		
	1	2	3
T1	0.44	0.46	0.35
T2	0.49	0.61	0.14
T3	0.64	0.03	0.06
T4	0.62	0.15	0.53
T5	0.50	0.50	0.43
T6	0.66	0.33	0.14
T7	0.58	0.17	0.55
T8	0.39	0.08	0.03
T9	0.39	0.53	0.46
T10	0.51	0.43	0.33

Extraction Method: Principal Component Analysis. Three components were extracted.

In the present study, to achieve the definitions of factors, a coefficient equal to 0.40 was considered the factor load limit. Thus, based on the results of factor analysis and the indicators mentioned, three factors (Disturbance, nighttime, parents) with a specific value greater than 0.4 emerged from the set of questions, which together explained 55% of the variance. The extracted factors must be transferred to the new axes using the Varimax rotation to obtain a meaningful structure for the data under analysis. Table 5

Table 5 *Total Variance Explained*

Item	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% Of Variance	Cumulative %	Total	% Of Variance	Cumulative %
1	2.83	28.25	28.25	2.83	28.25	28.25
2	1.47	14.67	42.92	1.47	14.67	42.91
3	1.25	12.45	55.37	1.24	12.45	55.37
4	0.93	9.26	64.63			
5	0.81	8.06	72.70			
6	0.70	6.98	79.68			
7	0.59	5.91	85.58			
8	0.52	5.17	90.75			
9	0.51	5.07	95.82			
10	0.42	4.18	100.00			

Extraction Method: Principal Component Analysis.

Confirmatory Factor Analysis

The confirmatory factor analysis (CFA) results showed that the model has a good fit and the two fit indices (CFI=0.94 and RMSEA =0.05) suggest that this model has provided the best fit for the data. Table 6, figure 1

Table 6 fit indices

Index	χ^2 / df	CFI	RMSEA	TLI
Result	2	0.98	0.005	0.99

Discussion

In 2005, the first version of TCSQ in English was evaluated in terms of validity and reliability. This questionnaire was prepared from two different groups of questions. The first group consisted of questions 1, 2, 3, 5, and 6. These questions were adapted from the Sleep Disturbance Scale for Children (SDSC) questionnaire developed by Bruni et al. in 1996 [23]. These questions could be used to screen for sleep disorders in all age groups. The second group, which included questions 4, 7, 9, and 10, was more concerned with children's sleep disorders, especially in one to five years [18].

In the current cross-sectional study, the Persian version of TCSQ using the forward-backward translation method is created from the English version prepared by McGreavy et al. In a similar study in Korea in 2020, Yesol et al. published the Korean version of the TCSQ [19].

We asked the opinion of three experts, and it appears that P-TCSQ, at face value, measures what it claimed to, and the items on P-TCSQ are representative of the entire domain of sleep disorders among children in terms of face and content validity, respectively. Similar face and content validity results have been obtained previously in surveys of Yesol et al. and McGreavy et al. [18, 19].

In the EFA of Yesol et al. study, K-TCSQ has two factors with three items in each factor. Initiating sleep factor consists of questions 1,2, and 3, and maintaining consists of questions 5,6, 8 [19].

In the current survey, we also used EFA to uncover the underlying hypothetical constructs of our variables (questions). The primary purpose of EFA is to summarize many variables in a limited number of factors in order to have the least amount of information loss. Also, orthogonal rotation of varimax is used to maximize the variance of variables loaded in the factor columns of the factor matrix to find the best solution and evaluate the construct validity of P-TCSQ. The factor analysis indicates that ten questions of P-TCSQ can be summarized into three factors: disturbance, nighttime, and parents.

Another subtype of construct validity as convergence validity, is evaluated by the BEARS sleep questionnaire. It indicates that a positive correlation between the BEARS and P-TCSQ exists and shows that their theoretically related measures are correlated. Similarly, in the study of the Korean version, the Korean-Child behavior checklist 1.5-5 (K-CBCL) was used to check the convergent validity. The positive correlation was reported and confirmed in terms of convergent validity [19].

The intra-class correlation coefficient of 0.67 showed that the reproducibility of the results is moderately approved and desirable.

Cronbach's alpha of the English version was 0.85, while Cronbach's alpha of the Persian version was 0.76. Although Cronbach's alpha decreased in this study, according to Bland and Altman's theory, scales with an internal consistency coefficient greater than 0.7 can still be used for research purposes [24].

After exploratory factor analysis, confirmatory factor analysis was performed. Chi-square (χ^2/df), Goodness-of-Fit Index (GFI), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA) were used for structural equation modeling (SEM). Factor analysis confirmed that the model fits well with the data.

Conclusions

P-TCSQ has good validity and reliability. It can be used as a simple and accessible tool for various studies in sleep medicine.

Suggestion

We suggest that researchers use P-TCSQ in their future surveys. Also, P-TCSQ can be used in clinical practice.

Abbreviations

SDH: Social Determinants of Health

DSM-V: Diagnostic and Statistical Manual of Mental Disorders, fifth edition

ICSD3: International Classification of Sleep Disorders third edition

EEG: Electroencephalogram

TCSQ: Tayside Children's Sleep Questionnaire

DIMS: Disorders of Initiating and Maintaining Sleep

P-TCSQ: Persian version of the Tayside Children's Sleep Questionnaire

ICC: Intra-class correlation coefficient

EFA: Exploratory Factor Analysis

PCA: Principal Component Analysis

SPSS: Statistical Package for the Social Sciences

CFA: confirmatory factor analysis

CFI: Comparative Fit Index

RMSEA: Root Mean Square Error of Approximation

GFI: Goodness-of-Fit Index

NFI: Normed Fit Index

TLI: Tucker-Lewis Index

SEM: structural equation modeling

CVR: Content Validity Ratio

CVI: Content validity index

KMO: Kaiser-Meyer-Olkin

SDSC: Sleep Disturbance Scale for Children

K-CBCL: Korean-Child behavior checklist

Declarations

Ethics approval and consent to participate

According to the request made to clarify the satisfaction of participating in the study, we must say that all children who participated in this study were informed about the study according to their understanding and their questions in this regard have been answered. The parents of these children were also aware of the objectives of the study and signed the consent form. We corresponded with the developer of the original version of the TCSQ and obtained permission. This work was approved by the Research Ethics Committees of Kashan University of Medical Sciences with approval ID: IR.KAUMS.NUHEPM.REC.1400.027.

Consent for publication

we consent to publish the manuscript

Availability of data and materials

On reasonable request, the dataset of the current survey is available from the authors.

Competing interests

We declare that there is not any conflict of interest.

Funding

No funding

Author's contributions

Both authors contributed to writing all sections.

Acknowledgments

We thank McGreavy et al., all participants in this study, and Ms. Maryam Rajaei Rizi for her help in the data gathering.

References

1. Li L, Ren J, Shi L, Jin X, Yan C, Jiang F, Shen X, Li S: **Frequent nocturnal awakening in children: prevalence, risk factors, and associations with subjective sleep perception and daytime sleepiness.**

- BMC psychiatry* 2014, **14**(1):1-11.
2. Santos IS, Bassani DG, Matijasevich A, Halal CS, Del-Ponte B, da Cruz SH, Anselmi L, Albernaz E, Fernandes M, Tovo-Rodrigues L: **Infant sleep hygiene counseling (sleep trial): protocol of a randomized controlled trial.** *BMC psychiatry* 2016, **16**(1):1-9.
 3. Deng X, He M, He D, Zhu Y, Zhang Z, Niu W: **Sleep duration and obesity in children and adolescents: evidence from an updated and dose–response meta-analysis.** *Sleep Medicine* 2021, **78**:169-181.
 4. Short MA, Blunden S, Rigney G, Matricciani L, Coussens S, Reynolds CM, Galland B: **Cognition and objectively measured sleep duration in children: a systematic review and meta-analysis.** *Sleep health* 2018, **4**(3):292-300.
 5. Åslund L, Arnberg F, Kanstrup M, Lekander M: **Cognitive and behavioral interventions to improve sleep in school-age children and adolescents: A systematic review and meta-analysis.** *Journal of Clinical Sleep Medicine* 2018, **14**(11):1937-1947.
 6. Gruber R, Fontil L, Bergmame L, Wiebe ST, Amsel R, Frenette S, Carrier J: **Contributions of circadian tendencies and behavioral problems to sleep onset problems of children with ADHD.** *BMC psychiatry* 2012, **12**(1):1-11.
 7. Thorpy M: **International classification of sleep disorders.** In: *Sleep disorders medicine.* edn.: Springer; 2017: 475-484.
 8. Sateia MJ: **International classification of sleep disorders-third edition: highlights and modifications.** *Chest* 2014, **146**(5):1387-1394.
 9. Substance A, Mental HSA: **Impact of the DSM-IV to DSM-5 Changes on the National Survey on Drug Use and Health.** 2016.
 10. Togeiro SMGP, Smith AK: **Diagnostics methods for sleep disorders.** *Brazilian Journal of Psychiatry* 2005, **27**:8-15.
 11. Rundo JV, Downey III R: **Polysomnography.** *Handbook of clinical neurology* 2019, **160**:381-392.
 12. Ibáñez V, Silva J, Cauli O: **A survey on sleep questionnaires and diaries.** *Sleep medicine* 2018, **42**:90-96.
 13. Ustun B, Westover MB, Rudin C, Bianchi MT: **Clinical prediction models for sleep apnea: the importance of medical history over symptoms.** *Journal of Clinical Sleep Medicine* 2016, **12**(2):161-168.
 14. Ophoff D, Slaats M, Boudewyns A, Glazemakers I, Van Hoorenbeeck K, Verhulst S: **Sleep disorders during childhood: a practical review.** *European journal of pediatrics* 2018, **177**(5):641-648.
 15. Okada M, Kitamura S, Iwadare Y, Tachimori H, Kamei Y, Higuchi S, Mishima K: **Reliability and validity of a brief sleep questionnaire for children in Japan.** *Journal of physiological anthropology* 2017, **36**(1):1-8.
 16. Spruyt K, Gozal D: **Pediatric sleep questionnaires as diagnostic or epidemiological tools: a review of currently available instruments.** *Sleep medicine reviews* 2011, **15**(1):19-32.

17. Ter Heege FM, Mijster T, van Veen MM, Pijnenborg GH, de Jong PJ, Boersma GJ, Lancel M: **The clinical relevance of early identification and treatment of sleep disorders in mental health care: protocol of a randomized control trial.** *BMC psychiatry* 2020, **20**(1):1-10.
18. McGreavey JA, Donnan P, Pagliari H, Sullivan F: **The Tayside children's sleep questionnaire: a simple tool to evaluate sleep problems in young children.** *Child: care, health and development* 2005, **31**(5):539-544.
19. Yesol S, Soyeon L: **A Validation Study of the Korean Tayside Children's Sleep Questionnaire (K-TCSQ).** *the journal of play therapy* 2020, **24**(3):93-106.
20. Anthoine E, Moret L, Regnault A, Sébille V, Hardouin J-B: **Sample size used to validate a scale: a review of publications on newly-developed patient reported outcomes measures.** *Health and Quality of Life Outcomes* 2014, **12**(1):2.
21. Mohammadi M, Ebrahim Amintehran MF, Ghaleh-bandji MRA, Shoaee S, Ghalehbaghi B: **Reliability and validity of Persian version of "BEARS" pediatric sleep questionnaire.** *Indian Journal of Sleep Medicine (IJSM)* 2008, **3**(1).
22. Yen M, Lo L-H: **Examining test-retest reliability: an intra-class correlation approach.** *Nursing research* 2002, **51**(1):59-62.
23. Bruni O, Ottaviano S, Guidetti V, Romoli M, Innocenzi M, Cortesi F, Giannotti F: **The Sleep Disturbance Scale for Children (SDSC) Construct ion and validation of an instrument to evaluate sleep disturbances in childhood and adolescence.** *Journal of sleep research* 1996, **5**(4):251-261.
24. Bland JM, Altman DG: **Statistics notes: Cronbach's alpha.** *Bmj* 1997, **314**(7080):572.

Figures

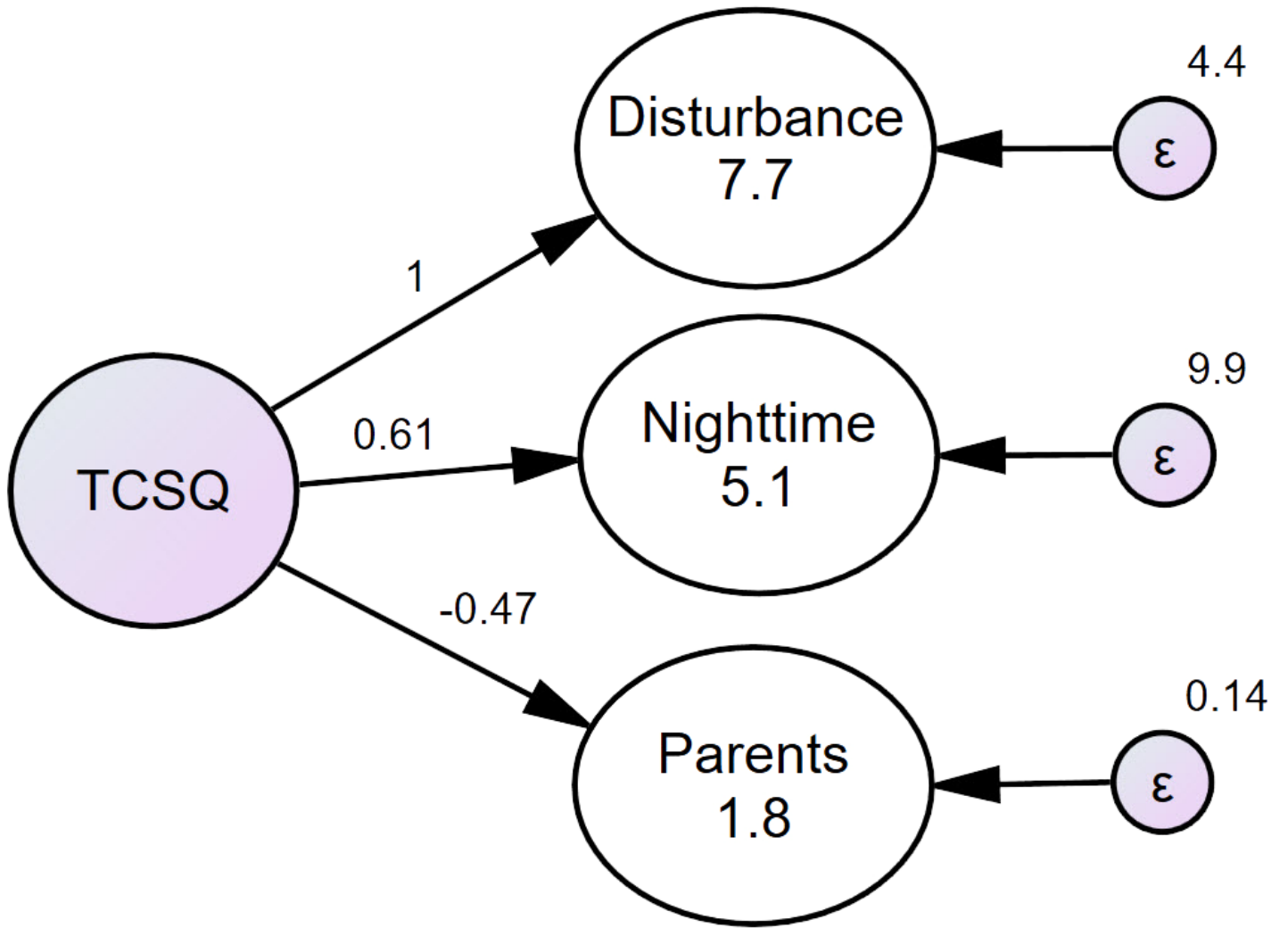


Figure 1
CFA diagram