



# Predicting quality of sleep based on emotion regulation and resiliency among men with substance-related disorders in western Iran: Results from a diagnostic analysis model



Vahid Farnia<sup>a</sup>, Toraj Ahmadi Juibari<sup>a</sup>, Behrouz Behrouz<sup>a</sup>, Mohyedin Mohammad Khani<sup>b</sup>, Mostafa Alikhani<sup>a,\*</sup>, Sara Hookari<sup>a</sup>, Behzad Behrouz<sup>a</sup>

<sup>a</sup> Substance Abuse Prevention Research Center, Kermanshah University of Medical Sciences, Kermanshah, Iran

<sup>b</sup> University of Payame Noor, Tehran, Iran

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## ABSTRACT

**Objectives:** Substance abuse affects the quality of sleep and various factors can be effective as mediators of sleep quality. Therefore, the current study carried out in order to predict quality of sleep based on emotion regulation and resiliency among men with substance-related disorders (SRDs).

**Methods:** the current study was a descriptive correlative study. The statistical population includes men with SRDs referred to maintenance treatment center (MMT) in Kermanshah City, among which 400 participants were selected based on convenient sampling. The obtained data were analyzed using descriptive statistics, chi-square test, Fisher's exact test, and the diagnostic analysis model.

**Results:** the results of the study show that there was a significant relationship between increase in age and education level and the quality of sleep in men with SRDs ( $P < 0.05$ ). However, the relationship between the duration of substance abuse and quality of sleep was not significant ( $P > 0.05$ ). There was a significant relationship between emotion regulation strategies including rumination, self-blame and other-blame, catastrophizing, and acceptance and quality of sleep in men with SRDs, and the difference regarding emotion regulation and resilience between people with and without good quality of sleep was also significant ( $P < 0.05$ ). Moreover, the results indicate that there is a significant relationship between resilience and the component of spirituality and the quality of sleep in men with SRDs. Finally, the two predicting variables of emotion regulation and resiliency were able to explain 69% of the variance in quality of sleep.

**Conclusions:** using negative and non-adaptive emotion regulation strategies and low resiliency can reduce the quality of sleep among men with SRDs.

## 1. Introduction

Substance-related disorders (SRDs) are among one of the healthcare, psychological, and social challenges of the current century.<sup>1</sup> The main characteristic of SRDs include a set of cognitive, behavioral, and physiological symptoms, which show that despite having serious problems with substance abuse, the individual continues taking drugs.<sup>2</sup> Substance abuse influences various aspects of health.<sup>3</sup> One of the complications resulting from drug abuse, which does not get sufficient attention from scholars and healthcare professionals, is the quality of sleep among people with SRDs.<sup>4,5</sup> Quality of sleep is defined as satisfaction with various qualitative aspects of sleep such as the duration of sleep its related excitations, as well as more concrete aspects such as the depth

of sleep or the relaxing effect of sleep.<sup>6</sup> One of the factors which can influence quality of sleep is how cognitive-emotional regulation strategies are utilized.<sup>7</sup> Emotion regulation refers to all the cognitive strategies which indicate the coping mechanisms used by an individual for dealing with stressful situations and terrible events.<sup>8</sup> The previous researches<sup>9–11</sup> shows that having a low level of skill in emotion regulation may be related to sleep problems, while Substance abuse has a mutual relationship with sleep problems.<sup>12</sup>

Another factor affecting the quality of sleep is resiliency.<sup>13</sup> A very limited number of studies have been carried out on the relationship between resiliency and quality of sleep, and the obtained results are most often in conflict.<sup>14,15</sup> While some scholars define resiliency as the lack of psychological complications in response to traumatic events,

\* Corresponding author. Substance abuse prevention research center, Farabi hospital, Kermanshah University of medical sciences, Kermanshah, Iran.

E-mail address: [M.alikhani18@yahoo.com](mailto:M.alikhani18@yahoo.com) (M. Alikhani).

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others focus more on the process of resiliency, showing rapid adoption to stressful events.<sup>16</sup> Considering the importance of quality of sleep and its role in health, as well as the conflicts found in studies on the mutual relationship between sleep and SRDs, and since substance abuser go through a lot of physiological and mental changes, with an increase in the extent of being influenced by various life stresses during Substance abuse, the current study has been carried out in order to predict quality of sleep based on emotion regulation and resiliency in men with SRDs.

## 2. Materials and methods

### 2.1. Design and setting

The current study is a descriptive cross-sectional study which utilizes a correlative methodology. The statistical population includes all the men with SRDs referred to MMT in Kermanshah City, western Iran from 2017 to 2018. Using convenient sampling and considering the sufficiency of the sample size for correlation schemes of multivariate regression type, the minimum sample size with an accuracy of  $d = 0.05$  and confidence level of 95%, considering a prevalence of 0.50, was determined to be 400 participants.

A patient was included in the study if the following criteria were met: addiction to one of the substances, as diagnosed by a psychiatrist and based on the DSM-5 criteria, Undergoing MMT, being literate, being at the age range of 20–40 years, and informed consent for participating in the study.

The exclusion criteria were: having complete criteria for mental disorders; meeting complete criteria for personality disorders and mental disorders resulting from a general medicinal disorder; using sleep medications; suffering from any type of cognitive disorders, or neurological and debilitating diseases such as cancer, hepatitis, and AIDS; having pain because of a known physical illness, and lack of willingness to participate in the study. The required data were collected using interviews and self-report scales completed by a mental health professional while visiting the rehab facilities. The data gathering tools used in the study included the following:

### 2.2. Tools

#### 2.2.1. Connor-Davidson resilience scale (CD-RISC)

This scale was developed by Connor and Davidson, and it includes 25 questions in 5 subscales including personal competence and high standards; trust in one's instincts and tolerance of negative affect; positive acceptance of change and secure relationships; control; and spiritual influences. The questions are scored based on Likert spectrum from zero (=completely wrong) to 5 (=completely correct). The reliability of the scale was measured using Cronbach's Alpha coefficient by the developers which yielded 0.89, while its reliability using the retest method after 4 weeks was reported as 0.87.<sup>17</sup>

#### 2.2.2. Cognitive emotion regulation questionnaire (CERQ)

This questionnaire was developed by Garnefski et al. and it includes 36 questions in 9 subscales including self-blame, acceptance, rumination, positive refocusing, planning, positive reappraisal, putting into perspective, catastrophizing, and other-blame. The items are scored based on a Likert spectrum from 5 (always) to 1 (never). The developers of the questionnaire reported its reliability based on Cronbach's Alpha coefficient for negative emotion regulation as 0.97, for positive emotion regulation as 0.87, and for the entire questionnaire as 0.93.<sup>18</sup>

#### 2.2.3. The Pittsburgh sleep quality Index

This scale was developed by Buysse et al. and it includes 19 self-report items, distinguishing proper and improper sleep by evaluating seven characteristics during the last month. These seven characteristics include subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and

daytime dysfunction. Questions 1, 2, 3, and 4 are open answered; questions 5 (with A-Z), 6, 7, and 8 have options including never (a score of zero), less than once a week (a score of 1), once or twice a week (a score of 2), and three or more times a week (a score of 3); and questions 9 has options including very good (a score of zero), relatively good (a score of 1), relatively bad (a score of 2), and very bad (a score of 3). In order to calculate the total score for an individual, the scores for all questions are added up, which will be in a range of 0–21. The higher the obtained score, the lower the quality of sleep. A score higher than 5 indicates sleep disorder or bad quality of sleep for an individual. The reliability and validity of the questionnaire have been reported in many studies, giving acceptable validity and reliability.<sup>19</sup> Buysse et al. reported the sensitivity and specificity of the questionnaire as 89.6 and 86.5%, respectively; while they reported an internal reliability equal to  $\alpha = 0.83$  for the questionnaire. Moreover, they evaluated the reliability of the questionnaire using the retest method, which led to Correlation Coefficient( $r$ ) = 0.85).<sup>19</sup>

### 2.3. Data analysis

In order to analyze the obtained data, descriptive statistics (frequency, and percentage), the chi-square test and the discriminant analysis model were utilized. Sleep quality was defined as dependent variable and emotion regulation (self-blame, acceptance, rumination, positive refocusing, planning, positive reappraisal, putting into perspective, catastrophizing, and other-blame) and resiliency (personal competence and high standards; trust in one's instincts and tolerance of negative affect; positive acceptance of change and secure relationships; control; and spiritual influences) as independent variables. All the analyses were performed using SPSS software application version 20, and the significance level of 0.05 was considered.

### 2.4. Ethical considerations

This study is an extract from a confirmed research scheme with an ethical code of IR.KUMS.REC.1396.528 in Medical University of Kermanshah. In this study, the considerations put forth in World Medical Association Declaration of Helsinki were followed. In other words, at the beginning of the study, the researcher first introduced himself/herself, and after providing complete information about the study, its objectives, and the method of completing the questionnaires, he/she emphasized the fact that the information provided by the participants would remain confidential and the results of the study would be published without mentioning the name and personal information of the participants so that the participants could complete the questionnaires willingly.

## 3. Results

The average age of the participants was  $34.77 \pm 7.55$  years with a variation range of 20–60 years entered the study. Evaluation of the level of quality of sleep showed that 249 participants (62.3%) had a bad quality of sleep, while 151 participants (37.8%) had a good quality of sleep. The average age of the substance abusers with good quality of sleep was  $36.67 \pm 5.87$  years with a variation range of 23–45 years, while for the drug abusers with bad quality of sleep, it was  $33.62 \pm 8.20$  years with a variation range of 20–60 years. For the group with good quality of sleep, the age groups of 31–40 years and 41–50 years had the highest numbers of participants with 76 individuals (50.3%) and 52 individuals (34.4%), respectively. The age range of 20–30 years for this group of participants with 23 participants (15.2%) had the lowest frequency. However, in the group of drug abusers with bad quality of sleep, the age groups of 20–30 years and 31–40 years with 120 individuals (48.2%) and 75 individuals (30.1%), respectively, had the highest number of participants. for this group of participants, the age group of 51–60 years with 6 individuals (2.4%) had the lowest

frequency. With regards to education level, among the participants with good quality of sleep, the education levels of secondary school and high school with 54 individuals (35.70%) and 42 individuals (27.70%), respectively, had the highest frequency. Three individuals (2%) had primary level education, 24 individuals (15.80%) had an associate degree, and 28 individuals (19%) had a bachelor's degree or higher. In other words, more than 65% of the participants had an education level of high school diploma or lower. For the group with bad quality of sleep, the level of secondary school education and high school diploma with 78 individuals (31.3%) and 28 individuals (19%), respectively, had the highest frequency. Furthermore, 51 individuals (20.5%) had primary school education, 36 individuals (14.5%) had an associate degree, and 18 individuals (7.2%) had a bachelor's degree or higher. Moreover, in this group, approximately 79% of the participants had high school diploma or lower levels of education. The majority of participants, 100 individuals (66.2%), in the group with good quality of sleep, had more than two years of Substance abuse history. Fifty individuals (33.1%) had between one to two years of abuse history, and only 1 individual (0.7%) had less than a year of drug abuse history. In the group with bad quality of sleep, the majority of participants, 124 individuals (49.8%), had more than two years of Substance abuse history, 100 individuals (40.2%) had a year to two years of history, and 25 individuals (10.0%) had less than one year of drug abuse history (Table 1).

The results of evaluating the assumptions of diagnosis analysis are obtained using the analysis of variables that utilize histograms and scatter plots. The presence of outlier points in the scatter plots for each predictor did not show the non-linearity of the relationship between predictors or serious deviation from the multivariate normal hypothesis for the predictors. Accordingly, 151 individuals in the first group, i.e. men with SRDs with a good quality of sleep, and 249 individuals in the second group, i.e. men with SRDs with a bad quality of sleep, were entered into the diagnostic model as the response variable. Emotion regulation with 9 subscales and resiliency with 5 subscales were entered into the diagnostic model as the predicting variables for good or bad quality of sleep of the drug abusers. The results from comparing the average values of the predicting variables between the two groups, 151 individuals with good quality of sleep and 249 individuals with bad quality of sleep, are presented in Table 1. The standard deviation for the predicting variables does not show a significant difference between the two groups. Moreover, when comparing the average values of predicting variables between the two groups, based on the values of Wilks' lambda, the F statistic, and the significance level, it can be concluded that the difference between the two groups with regards to the average values of all the predicting variables including self-blame, acceptance, rumination, positive refocusing, planning, reappraisal, putting into perspective, catastrophizing, other-blame, as well as competence, trust in instincts, positive acceptance of change, control, and spiritual

influences is significant at the error level of less than 0.05 (*all P* *s* < 0.05). This can also be deduced from the difference between the average values of the predictors in each group and the total average of that predictor as well (Table 2).

Based on the results of the Box's test and Box's M Test, the value of the covariance matrix for the participants with SRDs with good quality of sleep equals - 22.59, while it equals 6.06 for the participants with SRDs with bad quality of sleep. The results of evaluating the equivalence of covariance matrices between the two groups show that with a probability of (*F* = 37.65, *p* < 0.0001), the covariance matrices for the two group have a significant statistical difference, and this significance can be attributed to the high sensitivity of this test to large sample sizes. Considering the number of groups, running the diagnostic analysis of a canonical diagnosis function showed that considering its Eigen value (*V* = 2.24), it could be said that this diagnosis function had a high explaining power for distinguishing the two groups, i.e. with and without good quality of sleep, and was able to determine 100% of the variance in groups. In other words, the proposed model is able to explain 69% of the variation for the variable of quality of sleep among SRDs. The values of statistics including Wilks' lambda and chi-square ( $\lambda = 0.31$ ,  $\chi^2 = 460.30$ ) and their significance level (*p* < 0.0001) indicate a difference in mean values between the groups, and show that the proposed diagnostic function only failed to explain *Eta* = 31.0% of the variations in the quality of sleep. The value of the canonical correlation coefficient (*R<sub>c</sub>* = 0.832) indicates a strong relationship between diagnostic scores and the groups selected for the study (Table 3).

The coefficients of the canonical diagnostic function along with the standardized canonical diagnostic function, the coefficients of the classification function, and the structural coefficient matrix are presented in Table 3. These results show that among the 14 selected independent variables, the variables of rumination, other-blame, acceptance, self-blame, spiritual influences, and catastrophizing with standard coefficients of - 0.791, - 0.659, 0.371, - 0.354, 0.313, and - 0.259, respectively, have the highest contribution to the diagnostic function. In contrast, factors including positive refocusing, putting into perspective, trust in one's instincts, control, positive acceptance of change, reappraisal, competence, and planning with corresponding coefficients of 0.033, 0.051, - 0.062, 0.151, 0.170, 0.207, 0.228, and - 0.238, respectively, have the lowest contribution to the diagnostic function and its success. Furthermore, the structural coefficients show that variables of catastrophizing, rumination, other-blame, spiritual influences, reappraisal, planning, acceptance, competence, and self-blame with respective correlation coefficients of - 0.436, - 0.425, - 0.402, 0.339, 0.328, 0.324, 0.240, 0.223, and - 0.200 have a stronger relationship with the diagnostic function. In contrast, variables of refocusing, putting into perspective, control, trust in one's instincts, and positive acceptance of change with respective correlation coefficients of

**Table 1**  
Descriptive Statistics for Good and Bad Quality of Sleep along with Demographic Characteristics for men with SRDs.

Variable	Levels	group		Total	Sig	
		Good sleep quality (≤ 5)	Bad sleep quality (>5)			Frequency (%)
Demographic characteristics	Age, years	20–30	23 (15.2)	120 (48.2)	143 (35.8)	0.012
		31–40	76 (50.3)	75 (30.1)	151 (37.8)	
		41–50	52 (34.4)	48 (19.3)	100 (25.0)	
		51–60	0	20 (2.4)	6 (1.5)	
	Education	Primary school	3 (2.00)	51 (20.5)	54 (13.5)	0.007
		High school	54 (35.70)	78 (31.3)	132 (33%)	
		Diploma	42 (27.70)	66 (26.5)	108 (27%)	
		High Diploma	24 (15.80)	36 (14.5)	60 (15%)	
		Bachelor and Higher	28 (19.00)	18 (7.2)	46 (11.5)	
	Duration of substance abuse	Less than 1 year	1 (0.7)	25 (10%)	26 (6.5)	0.141
		1–2 years	50 (33.1)	100 (40.2)	150 (37.5)	
		More than 2 years	100 (66.2)	124 (49.8)	224 (56%)	
	Total		151 (37.8)	249 (62.3)	400 (100%)	

**Table 2**  
Descriptive Statistics for Predicting Variables for the Entire Sample and for Individual Groups along with the Results of Comparing the Average Values of Predicting Variables between the Two groups of men with SRDs with and without a Good Quality of Sleep.

Variable	Quality of Sleep	n	M	SD	$\lambda$	F	Df1	Df2	Sig	N	Total M	Total SD	
emotion regulation	Self - blame	good	151	14.18	0.92	0.92	35.87	1	398	< 0.0001	400	14.72	1.46
		bad	249	15.05	1.67								
acceptance		good	151	6.96	1.00	0.886	51.29			< 0.0001		6.37	1.35
		bad	249	6.02	1.41								
rumination		good	151	9.39	0.81	0.985	6.24			0.013		9.67	1.69
		bad	249	9.83	2.04								
positive refocusing		good	151	7.67	0.85	0.712	161.32			< 0.0001		6.77	1.32
		bad	249	6.22	1.25								
planning		good	151	5.99	2.16	0.810	93.61			< 0.0001		7.06	1.78
		bad	249	6.45	1.14								
reappraisal		good	151	4.63	1.15	0.800	95.88			< 0.0001		6.42	1.13
		bad	249	6.04	0.92								
putting into perspective		good	151	3.25	2.04	0.981	7.59			0.006		6.73	1.69
		bad	249	6.55	1.41								
catastrophizing		good	151	9.81	1.82	0.701	169.52			< 0.0001		11.36	2.21
		bad	249	12.30	18.7								
other-blame		good	151	10.81	0.45	0.734	144.46			< 0.0001		11.89	1.63
		bad	249	12.55	1.73								
resiliency	personal competence	good	151	13.43	1.37	0.900	44.46			< 0.0001		12.74	1.69
		bad	249	12.32	1.74								
trust in instincts		good	151	10.52	0.58	0.961	16.12			< 0.0001		10.14	1.50
		bad	249	9.91	1.81								
positive acceptance of change		good	151	6.60	0.97	0.922	33.53			< 0.0001		6.05	1.48
		bad	249	5.73	1.64								
control		good	151	4.46	1.04	0.981	7.86			0.005		4.29	0.92
		bad	249	4.20	0.82								
spiritual influences		good	151	3.85	0.91	0.795	102.92			< 0.0001		3.22	1.07
		bad	249	2.85	0.98								

N: Number, M: Mean, SD: Standard Deviation.  $\lambda$ : wilks Lamboda, DF: Degrees of Freedom

0.084, 0.092, 0.094, 0.134, and 0.194 have the weakest relationship with the diagnostic function. Based on these estimations, the equation for the diagnostic function is as follows:

The score for the diagnostic function (DF<sub>1</sub>) = -2.114 (constant)

$$\begin{aligned}
 & - 0.254 (\text{self} - \text{blame}) \\
 & - 0.427 (\text{other} - \text{blame}) \\
 & - 0.711 (\text{rumination}) \\
 & - 0.028 (\text{catastrophizing}) \\
 & + 0.291 (\text{acceptance}) + 0.20 (\text{refocusing}) \\
 & + 0.148 (\text{planning}) + 0.203 (\text{reappraisal}) \\
 & + 0.176 (\text{putting into perspective}) \\
 & + 0.141 (\text{competence}) \\
 & - 0.042 (\text{trust in instincts}) \\
 & + 0.119 (\text{positive acceptance of change}) \\
 & + 0.165 (\text{control}) \\
 & + 0.327 (\text{spiritual influences})
 \end{aligned}$$

The coefficients in the above equation show the individual contribution of each independent variable while controlling for the other variables. This equation distinguishes the two groups of SRDs with and without a good quality of sleep, and by replacing the values in the above equation for each participant in the study, the score of the diagnostic function for that participant will be obtained; the participant will be the member of the group where the highest value of the classified function for this participant is located. Depending on whether the value obtained from the diagnostic function is closer to the value of the function at the center of gravity of the SRDs with good quality of sleep or to that of the SRDs with bad quality of sleep, the participant will be placed in the corresponding group. The value of the function at the center of gravity for the group of SRDs with good quality of sleep equals 1.92, and for the group of SRDs with bad quality of sleep equals 1.16

(Table 4).

Classification of participants in the groups of people with SRDs with good quality of sleep and with bad quality of sleep, using the coefficients of the classification function, is performed as follows:

classification function for addicts with good quality of sleep

$$\begin{aligned}
 & = -497.859 (\text{constant}) + 15.397 (\text{self} - \text{blame}) + 4.985 (\text{other} - \text{blame}) \\
 & + 5.186 (\text{refocusing}) + 9.533 (\text{catastrophizing}) + 3.262 (\text{acceptance}) \\
 & - 12.728 (\text{rumination}) - 2.538 (\text{planning}) + 8.365 (\text{reappraisal}) \\
 & + 7.890 (\text{putting into perspective}) + 11.953 (\text{competence}) \\
 & + 12.003 (\text{trust in one's instincts}) \\
 & + 2.980 (\text{positive acceptance of change}) + 8.980 (\text{control}) \\
 & + 4.881 (\text{spiritual influences})
 \end{aligned}$$

classification function for addicts with bad quality of sleep

$$\begin{aligned}
 & = -490.177 (\text{constant}) + 16.176 (\text{self} - \text{blame}) + 6.441 (\text{other} - \text{blame}) \\
 & + 5.246 (\text{refocusing}) + 9.618 (\text{catastrophizing}) + 2.363 (\text{acceptance}) \\
 & - 10.537 (\text{rumination}) - 2.081 (\text{planning}) + 7.739 (\text{reappraisal}) \\
 & + 7.347 (\text{putting into perspective}) + 11.518 (\text{competence}) \\
 & + 12.134 (\text{trust in one's instincts}) \\
 & + 2.613 (\text{positive acceptance of change}) + 8.470 (\text{control}) \\
 & + 3.872 (\text{spiritual influences})
 \end{aligned}$$

In Table 5, the number and percentage of individuals correctly or incorrectly classified in the two groups are presented. The results of the classification show that 148 participants (98.0%) of the group of SRDs with good quality of sleep were correctly classified in the group with good quality of sleep and three participants (2.0%) among them were incorrectly classified into the group with bad quality of sleep. For the group with bad quality of sleep, 218 individuals (87.6%) were correctly classified into the group with bad quality of sleep and 31 individuals (12.4%) were incorrectly classified in the group with good quality of

**Table 3**  
Results of Tests for Evaluating the Assumptions of the Diagnostic Analysis Model and its Explaining Strength.

Covariance matrix of the two groups		BOX s M Test		Power explanatory model test		Correlation between diagnostic scores and group		Mean equality test of two groups	
People with bad quality sleep	People with good quality sleep	BOXs M	F	P-Value	$\nu$	$R_c$	$\lambda$	$x^2$	P-Value
- 22.59	6.06	4117.17	37.65	< 0.0001	2.245	0.832	0.31	460.30	< 0.0001

$\nu$ : Eigen Values, R: Canonical Correlation,  $\lambda$ : Wilks Lambda,  $x^2$ : Chi Square

sleep. Therefore, the accuracy of classification for the group of addicts with good quality of sleep is 98% and for the group of addicts with bad quality of sleep is 87.6%. Based on the accuracy of classification for both groups, 91.50% of the participants were correctly classified into their corresponding groups. Moreover, in order to illustrate the ability of the diagnostic function in classifying individuals in other samples, the *leave-one-out* method classifies 90.8% of the samples correctly (Table 5).

#### 4. Discussion

This study was carried out in order to predict quality of sleep based on emotion regulation and resiliency among men with SRDs in western Iran. The results of the study show that there is a significant relationship between higher age and education level and the quality of sleep among men with SRDs; however, there is no significant relationship between the duration of substance abuse and the quality of sleep. In line with the findings of the current study, Gadie et al.<sup>20</sup> show that the relationship between age and quality of sleep is significant. The results provided by Moore et al.<sup>21</sup> and Friedman et al.<sup>22</sup> show that by increasing the level of education, quality of sleep improves. In order to explain this finding, it can be said that when age and education level are higher, the individual is better able to cope with life stresses and contrary to teenage years, he/she will have a more consistent and realistic view of himself/herself and life, he will also be more capable of solving problems and showing higher efficiency while dealing with undesirable situations in life, and this consistency in thought and behavior as well as a higher sense of self-efficacy can be accompanied by lower levels of sleep disturbances in middle-aged addicts compared to younger addicts.

Moreover, the results of Mahomey et al.,<sup>23</sup> in line with the results of the current study, show that there is no significant relationship between the duration of addiction and quality of sleep. In order to explain this finding of the study, it can be said that according to previous studies,<sup>24,25</sup> before starting to abuse substance, addicts have a low quality of life and numerous mood and anxiety complications. Believing that substance abuse can be one of the strategies to cope with and mitigate problems,<sup>26</sup> these individuals tend to start abusing substance, and they want to mitigate their sleep disturbances through abusing substance, especially opiates.<sup>27</sup>

Another finding of the current study shows that there is a significant relationship between cognitive-emotion regulation strategies including rumination, self-blame and other-blame, catastrophizing, and acceptance and quality of sleep in people with SRDs. Moreover, there is a significant difference regarding emotion regulation between people with and without good quality of sleep. In line with this finding of the study, Schmidt et al.<sup>11</sup> show that there is a relationship between sleep disorders and negative emotion regulation. Moreover, Vandekerckhove et al.<sup>11</sup> and Vantieghem et al.<sup>28</sup> show that there is a relationship between rumination, self-blame, other-blame, and catastrophizing and sleep problems. Also, Hasler et al.<sup>29</sup> and Kenney et al.,<sup>30</sup> in line with the results of the current study, show that low quality of sleep is related to difficulty in emotion regulation.

In order to explain this finding, it can be said that difficulty in emotion regulation will lead to increased nighttime excitation and insomnia, and utilizing negative emotion regulation, particularly rumination, self-blame and other-blame, and catastrophizing will result in reduced quality of sleep.<sup>7</sup> Those individuals who when faced with traumatic events such as drug abuse become obsessed with thoughts related to these events and ruminate for a very long time will consider the event as a catastrophe, and passively submit to it.<sup>10,11</sup> In contrast, using positive emotion regulation strategies such as acceptance and reappraisal will improve quality of sleep among individuals with SRDs. People who after facing problems, shift their thoughts towards positive activities and experiences and consider their situation to be a flexible one, and stop suppressing emotions will be able to more quickly adapt

**Table 4**

Values of the coefficients of the canonical diagnostic function along with the coefficients of the standardized canonical diagnostic function, the coefficients of the classification function, and the structural coefficients matrix.

	Diagnostic function coefficients	Standardized coefficients	Coefficients of classification detection function		Structure Matrix
			bad quality sleep	good quality sleep	
putting into perspective	0.028	0.051	9.53	9.62	0.436
ruminantion	- 0.711	- 0.791	12.73	10.54	- 0.425
other-blame	- 0.427	- 0.659	4.98	6.44	- 0.402
spiritual influences	0.327	0.313	4.88	3.87	0.339
reappraisal	0.203	0.207	8.36	7.74	0.328
planning	- 0.148	- 0.238	- 2.54	- 2.08	0.324
acceptance	0.291	0.371	3.26	2.36	0.240
personal competence	0.141	0.228	11.95	11.52	0.223
Self - blame	- 0.254	- 0.354	15.39	16.18	- 0.20
positive acceptance of change	0.119	0.170	2.98	2.61	0.194
trust in instincts	- 0.042	- 0.062	12.00	12.13	0.134
control	0.165	0.151	8.98	8.47	0.094
catastrophizing	- 0.176	- 0.295	7.89	7.35	- 0.092
positive refocusing	0.020	0.033	5.18	5.25	0.84
Constant	- 2.114	-	- 497.859	- 490.177	-

to traumatic events and will have a better quality of sleep.<sup>7</sup>

Furthermore, the results of the study show that resiliency, particularly the component of spiritual influences, is related to quality of sleep among men with SRDs and the difference regarding resiliency between people with and without a good quality of sleep is significant. In line with this finding of the current study, McCuiston<sup>14</sup> shows that in patients with chronic pain, there is a significant relationship between quality of sleep and resiliency. Moreover, Pedersen et al.<sup>31</sup> show that resiliency in patients can play a predicting role in quality of sleep. In line with the current study, Young-McCaughan et al.<sup>32</sup> show that there is a relationship between quality of sleep and resiliency. In order to explain this finding of the study, it can be said that resiliency is not solely resistance to damages or threatening situations, i.e. a passive stance against dangerous conditions; rather, it refers to active and constructive participation in one's surrounding environment.<sup>17</sup> Tugade and Fredrickson<sup>33</sup> and Carle and Chassin<sup>34</sup> in separate studies show that high levels of resiliency will help an individual to better utilize positive emotions in order to overcome undesirable experience and return to a desirable state.

In order to explain this finding of the study, it can be said that spiritual influences, as one of the components of resiliency, much like a shield can increase resistance against life stresses (a protective factor) on the one hand, and as a positive adaptability process, it can help the development and growth of the individual (a developmental factor) on the other. Each one of the defensive and transformative levels of spiritual beliefs and values related to resiliency is somewhat related to improving the indicators and measures of mental health. In contrast, weakness in resiliency in terms of spiritual beliefs and values will increase the likelihood of psychological susceptibility including sleep problems by weakening the internal mental foundations of an individual's resiliency against life stresses and his/her ability to walk towards perfection and transcendence.<sup>35,36</sup>

**Table 5**

Classification of participants in two groups with and without good quality of sleep based on *leave – one – out* method.

groups		Predicted group for group membership		Total
		good quality sleep	bad quality sleep	
Main group	good quality sleep	148 (98%)	3 (2%)	151
	bad quality sleep	31 (12.4)	218 (87.6)	249
valid Crossover Group	good quality sleep	148 (98%)	3 (2%)	151
	bad quality sleep	34 (13.7)	215 (86.3)	249

**5. Conclusions**

In general, the findings of the current study show that emotion regulation and resiliency can be effective in improving quality of sleep among people with SRDs. Through regulating their emotions and increasing their resiliency, people with addiction will be able to cope with the challenges of addiction and experience a better quality of sleep. Among the limitations of this study, we can mention the impossibility of studying women with SRDs. Collecting research data using questionnaire may have also resulted in the bias and deviation in the responses of the participants. Therefore, when generalizing the results of this study to other populations, caution must be exercised. It is recommended that, besides quality of sleep, future studies investigate other sleep measures in people with SRDs in both men and women. Furthermore, it is recommended that future studies evaluate quality of sleep according to the kind of substance used. The results of this study can be used to improve the quality of sleep and mental health and reduce relapse in patients with SRDs.

**Declaration of interest**

The authors report no conflict of interest. The authors alone are responsible for the content and writing of the paper.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cegh.2018.12.008>.

## References

- Breslau J, Yu H, Han B, Pacula RL, Burns RM, Stein BD. Did the dependent coverage expansion increase risky substance use among young adults? *Drug Alcohol Depend.* 2017;178:556–561.
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. fifth ed. Arlington, VA: American Psychiatric Association; 2013.
- United Nations Office on Drugs and Crime. *World Drug Report*. Vienna: United Nations Office on Drugs and Crime; 2013.
- Mahfoud Y, Talih F, Stroom D, Budur K. Sleep disorders in substance abusers: how common are they? *Psychiatry*. 2009;6(9):38–42.
- Khazaie H, Jalali A, Jozani Y, Moradi S, Heydapour F, Khaledi-Paveh B. Comparative study on sleep quality and disorders in opiate and methamphetamine users. *Heroin Addict Relat Clin Probl.* 2016;18(6):21–28.
- Song YY, Hu RJ, Diao YS, Chen L, Jiang XL. Effects of exercise training on restless legs syndrome, depression, sleep quality, and fatigue among hemodialysis patients: a systematic review and meta-analysis. *J Pain Symptom Manag.* 2018;55(4):1184–1195.
- Guastella AJ, Moulds ML. The impact of rumination on sleep quality following a stressful life event. *Pers Individ Differ.* 2007;42(6):1151–1162.
- Sakakibara R. Does cognitive appraisal moderate the effects of cognitive emotion regulation strategies? A short-term longitudinal study. *Pers Individ Differ.* 2016;101:511–512.
- Deliens G, Gilson M, Peigneux P. Sleep and the processing of emotions. *Exp Brain Res.* 2014;232(5):1403–1414.
- Schmidt RE, Harvey AG, Van der Linden M. Cognitive and affective control in insomnia. *Front Psychol.* 2011;2:349.
- Vandekerckhove M, Wang Y. Emotion, emotion regulation and sleep: an intimate relationship. *AIMS Neuroscience.* 2017;5(1):1–22.
- Hasler BP, Smith LJ, Cousins JC, Bootzin RR. Circadian rhythms, sleep, and substance abuse. *Sleep Med Rev.* 2012;16(1):67–81.
- Carlson JM, Dikecligil GN, Greenberg T, Mujica-Parodi LR. Trait reappraisal is associated with resilience to acute psychological stress. *J Res Pers.* 2012;46(5) 2012;46(5):609–.
- McCustion TS. *The Relationship between Resilience and Sleep Quality*. Digital Commons@ACU Electronic Theses and Dissertations Abilene Christian University; 2016:4–22.
- Chatburn A, Coussens S, Kohler MJ. Resiliency as a mediator of the impact of sleep on child and adolescent behavior. *Nat Sci Sleep.* 2013;6:1–9.
- Meister RE, Weber T, Princip M, et al. Resilience as a correlate of acute stress disorder symptoms in patients with acute myocardial infarction. *Open heart.* 2015;2(1):e000261.
- Connor KM, Davidson JR. Development of a new resilience scale: the Connor-Davidson Resilience Scale (CD-RISC). *Depress Anxiety.* 2003;18(2):76–82.
- Goussinski N, Kraaji V, Spinhoven O. Negative life events, cognitive emotion regulation and emotional problems. *Pers Individ Differ.* 2001;30(8):1311–1327.
- Buysse DJ, Reynolds 3rd CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatr Res.* 1989;28(2):193–213.
- Gadie A, Shafto M, Leng Y, Kievit RA. How are age-related differences in sleep quality associated with health outcomes? An epidemiological investigation in a UK cohort of 2406 adults. *BMJ open.* 2017;7(7):e014920.
- Moore PJ, Adler NE, Williams DR, Jackson JS. Socioeconomic status and health: the role of sleep. *Psychosom Med.* 2002;64(2):337–344.
- Friedman EM, Love GD, Rosenkranz MA, et al. Socioeconomic status predicts objective and subjective sleep quality in aging women. *Psychosom Med.* 2007;69(7):682–691.
- Mahoney 3rd JJ, De La Garza 2nd R, Jackson BJ, et al. The relationship between sleep and drug use characteristics in participants with cocaine or methamphetamine use disorders. *Psychiatr Res.* 2014;219(2):367–371.
- Aspis I, Feingold D, Weiser M, Rehm J, Shoval G, Lev-Ran S. Cannabis use and mental health-related quality of life among individuals with depressive disorders. *Psychiatr Res.* 2015;230(2):341–349.
- Foster DW, Garey L, Buckner JD, Zvolensky MJ. Social anxiety and cannabis-related impairment: the synergistic influences of peer and parent descriptive and injunctive normative perceptions. *Subst Use Misuse.* 2016;51(7):912–921.
- Hormes JM, Kearns B, Timko CA. Craving Facebook? Behavioral addiction to online social networking and its association with emotion regulation deficits. *Addiction.* 2014;109(12):2079–2088.
- Khazaie H, Najafi F, Ghadami MR, et al. Sleep disorders in methadone maintenance treatment volunteers and opium-dependent patients. *Addiction & health.* 2016;8(2):84–89.
- Vantighem I, Marcoen N, Mairesse O, Vandekerckhove M. Emotion regulation mediates the relationship between personality and sleep quality. *Psychol Health.* 2016;31(9):1064–1079.
- Kenney SR, LaBrie JW, Hummer JF, Pham AT. Global sleep quality as a moderator of alcohol consumption and consequences in college students. *Addict Behav.* 2012;37(4):507–512.
- Pedersen ER, Troxel WM, Shih RA, Pinder E, Lee D, Geyer L. Increasing resilience through promotion of healthy sleep among service members. *Mil Med.* 2015;180(1):4–6.
- Young-McCaughan S, Peterson AL, Bingham MO. The role of sleep in the health and resiliency of military personnel. In: Vermetten E, Germain A, Neylan T, eds. *Sleep and Combat-related Post Traumatic Stress Disorder*. New York: Springer; 2018.
- Tugade MM, Fredrickson BL. Resilient individuals use positive emotions to bounce back from negative emotional experiences. *J Pers Soc Psychol.* 2004;86(2):320–333.
- Carle AC, Chassin L. Resilience in a community sample of children of alcoholics: its prevalence and relation internalising symptomatology and positive affect. *J Appl Dev Psychol.* 2004;25:577–596.
- Sojo V, Guarino L. Mediated moderation or moderated mediation: relationship between length of unemployment, resilience, coping and health. *Spanish J Psychol.* 2011;14(1):272–281.
- Drerup ML, Johnson TJ, Bindl S. Mediators of the relationship between religiousness/spirituality and alcohol problems in an adult community sample. *Addict Behav.* 2011;36(12):1317–1320.