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# Effects of Poor Sleep Quality on Attention, Anxiety and Foreign Language Performance in EFL College Students

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## Authors' contributions

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## ABSTRACT

Sleep quality has been found to be a critical issue to students' learning. The objective of the study was to investigate whether poor sleep quality impact inattention, foreign language learning anxiety, and foreign language performance in EFL college students. English scores of the receptive skills, reading and listening, inattention and foreign language learning anxiety were examined in 148 English major college students in Taiwan, who were divided into experimental group with Pittsburg Sleep Quality Index (PSQI)>5 (Poor-Sleep Group, n=70) and control group with PSQI≤5 (Normal-Sleep Group, n=78). Inattention and Foreign Language Learning Anxiety were significantly ( $P<0.05$ ) severer and higher in Poor-Sleep Group than in Normal-Sleep Group. English listening test scores were significantly lower in Poor-Sleep Group than in Normal-Sleep Group. However, English reading test scores were not different between Poor-Sleep Group and Normal-Sleep Group. Poor sleep quality in EFL College students with co-existed more attention deficits and higher foreign language learning anxiety did negatively influence English listening performance, but did not influence English reading performance.

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## 1. INTRODUCTION

Sleep and attention were consistently linked with language performance [1, 2]. Less sleep quality was associated with less growth in sustained attention and language performance [1]. Sleep disorders and attention deficit were often observed in adults and college students. Patients with Attention Deficit Hyperactivity Disorder (ADHD) often have difficulties to start and maintain sleep, reduce in sleep efficiency as well as behavioral and cognitive deficits were both found in patients with sleep disorders or ADHD [3]. Conners' Adult ADHD Rating Scales (CAARS) was used to measure the presence, severity and impact of ADHD in adults (Conners et al., 1999; Macey, 2003). It is still unclear whether EFL College students with poor sleep quality have more attention deficit and worsen English receptive skills, reading and listening.

The high anxiety levels and poor sleep quality frequently occurred in College students may be a consequence of high academic demand and a shift of circadian rhythms [4]. Sleep and anxiety feed one another reciprocally, which collectively impairs academic performance in ESL students [5]. Foreign Language Classroom Anxiety Scale (FLCAS) was developed by Horwitz (Horwitz, Horwitz, & Cope, 1986) and was often used to assess Foreign Language learning anxiety [6, 7]. The higher total scores of FLCAS refer to the higher foreign language classroom anxiety. It was unclear whether EFL College students with poor sleep quality might have higher foreign language learning anxiety and worsen English receptive skills, reading and listening.

One previous study found that the computer-detected low attention group of EFL students had increased state anxiety of listening and decreased listening test scores, comparing with the high attention group, but not in reading [8]. The factors which may influence listening and reading performance are quite different, for example, listening comprehension scores were enhanced by audio-visual aids in EFL College students without facilitating long-term retention but reading comprehension scores were not changed with facilitating long-term retention [9]. It was unknown whether EFL College students with poor sleep quality might influence EFL receptive skills, listening or reading, differently.

We hypothesized that EFL College students with poor sleep quality might have more attention deficit, higher foreign language anxiety, and might influence EFL listening or reading differently. To test this hypothesis, English reading test, English listening test, CAARS-scored inattention and FLCAS-scored foreign language learning anxiety were examined in EFL college students who were divided into Poor-Sleep Group with PSQI>5 and Normal-Sleep Group with PSQI≤5.

## 2. METHODS

### 2.1 Subjects

EFL College students were recruited to participate in the current study at a university in Taiwan. After being approved by the Medical Research Ethics Committee of Asia University, the study was completely described to all participants and they signed a written informed consent before their participation. We recruited 148 participants for the current study.

### 2.2 Instruments

#### 2.2.1 Pittsburg Sleep Quality Index (PSQI)

Pittsburg Sleep Quality Index (PSQI) [10] was used to define poor sleep quality. The Pittsburg Sleep Quality Index consists of 7 major components, and each component has a range from 0 to 3 points. The score 0 means no difficulty, while the score 3 means with severe difficulty, and the total score is from 0 to 21 points. The higher total score indicates a poorer sleep quality.

#### 2.2.2 Conners' Adult ADHD Rating Scales (CAARS)

Conners' Adult ADHD Rating Scales (CAARS) was used to measure the presence, severity and impact of Attention Deficit Hyperactivity Disorder (ADHD) symptoms in adults [11, 12]. The psychometric properties of attention deficit based on CAARS are highly satisfying with sensitivity 87% and specificity 85% [12]. The total scores range from 0 to 90 and the higher score means the more attention deficit.

#### 2.2.3 Foreign Language Classroom Anxiety Scale (FLCAS)

Foreign Language Classroom Anxiety Scale (FLCAS) was developed by Horwitz [13]. FLCAS

consists of thirty-three items in five-point Likert Scale. The total score from 33 to 165 and the higher score refers to the higher classroom anxiety.

### 2.2.4 English listening and reading performance

Students' foreign language performance in the present study includes listening and reading tests. Two literary texts were given respectively for the reading and listening test with fifteen multiple choice questions for each. Total scores are 100. Students were allowed to finish the listening test within 30 minutes and the reading test within 40 minutes in an offline mode in a computer classroom.

### 2.3 Procedure

All our participants signed a written informed consent after being explained all the advantages and disadvantages of the present study. After signing the consent, they began with completing

paper-based questionnaires in a regular classroom. The initial part of the questionnaires elicited participants' personal information and the second part contains the Pittsburg Sleep Quality Index for assessing general sleep quality, Conners' Adult ADHD Rating Scales (CAARS) for assessing attention deficit and Foreign Language Classroom Anxiety Scale (FLCAS) for assessing foreign language learning anxiety without time limitation. One week after finishing all paper-based questionnaires, students took the reading and listening tests in a computer classroom.

### 2.4 Statistical Analysis

Differences in inattention (CAARS), Foreign Language Classroom Anxiety Scale (FLCAS), English listening performance, and English reading performance between the Poor-Sleep Group with  $PSQI > 5$  vs. the Normal-Sleep Group with  $PSQI \leq 5$  were analyzed using statistical package for social sciences (SPSS) and tested by student t test. The alpha value for statistical significance was set at 0.05 ( $< 0.05$ ).

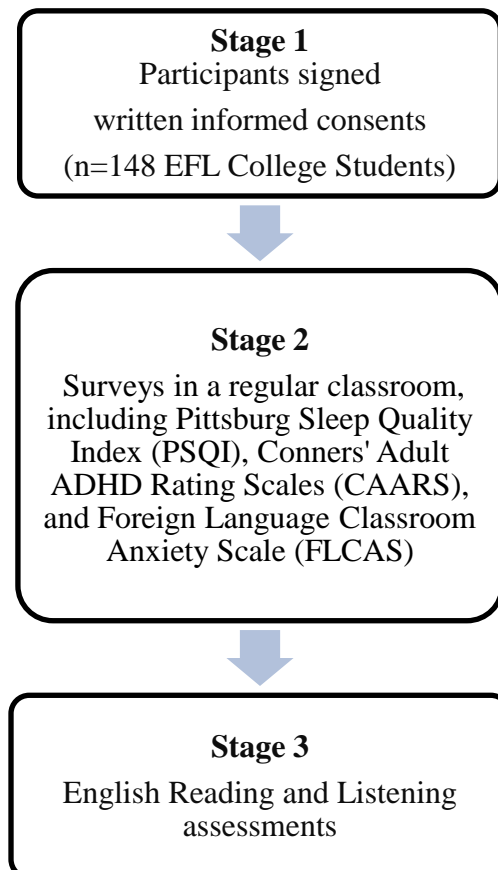


Fig. 1. The flowchart of data collection

### 3. RESULTS

Totally 148 EFL College Students participate and complete the whole study. The number of female EFL College Students was 112 (76% of total participants) and the number of male students was 36 (24% of total participants). The participants are 91 Sophomore and 57 Junior EFL College Students (Table 1).

**Table 1. Characteristics of EFL college students (n=148)**

Variable	n	%
<b>Gender</b>		
Male	36	24%
Female	112	76%
<b>Year/Age</b>		
Sophomore	91	62%
Junior	57	38%

*EFL college students who participate and complete the current study*

Inattention or attention deficits based on CAARS were significantly severer in Poor-Sleep Group with PSQI>5 than in Normal-Sleep Group with PSQI<=5 of EFL College Students (Table 2). Foreign Language Classroom Anxiety of EFL College Students was significantly higher in Poor-Sleep Group than in Normal-Sleep Group. English listening test scores of EFL College Students were significantly ( $p<0.05$ ) lower in Poor-Sleep Group than in Normal-Sleep Group. However, English reading test scores of EFL College Students were not different between Poor-Sleep Group and Normal-Sleep Group (Table 2).

### 4. DISCUSSION

Our major findings can be summarized as 1) EFL College Students with poor sleep quality have more CAARS-assessed inattention than those with normal sleep quality. 2) EFL College Students with poor sleep quality have more FLCAS-assessed foreign language learning anxiety than those with normal sleep quality. 3) Poor sleep quality assessed via PSQI>5 in EFL College students with co-existed more attention deficits and higher foreign language learning anxiety did negatively influence English listening performance, but did not influence English reading performance.

One review article concerning sleep in attention-deficit/hyperactivity disorder found that subjects who suffer from poor sleep quality or sleep disorders such as excessive daytime sleepiness, restless legs syndrome, periodic limb movement in sleep, sleep disordered breathing, and obstructive sleep apnea have been reported to exhibit more symptoms of attention deficits or hyperactivity disorder [14]. One study collected from 496 medical students found medical students' poorer sleep quality leads to lower attention in EFL class [2]. In the current study, EFL College Students with poor sleep quality based on PSQI>5 have more CAARS-assessed inattention than those with normal sleep quality and suggest that poor sleep quality in EFL College Students might lead to more attention deficits.

**Table 2. Comparison between poor and normal sleep group of EFL College students (n=148)**

Variable	PSQI	Mean	SD	MD	t	p
Inattention (CAARS)	<=5	9	3.706	-2.080	-3.718**	.000
	>5	11	3.774			
Anxiety (FLCAS)	<=5	94	12.081	-5.285	-2.893**	.004
	>5	99	12.354			
EFL Listening Scores	<=5	75	9.375	5.065	3.254**	.001
	>5	70	9.541			
EFL Reading Scores	<=5	76	8.137	1.403	1.034	.303
	>5	75	7.995			

*CAARS-scored inattention, FLCAS-scored foreign language learning anxiety, English reading Scores, English listening Scores were examined in EFL college students who were divided into Poor-Sleep Group with Pittsburgh Sleep Quality Index (PSQI)>5 and Normal-Sleep Group with PSQI<=5.*

*Note: \*  $p < 0.05$ , \*\*  $p < 0.01$ ; PSQI>5: Poor-Sleep Group (n=78); PSQI<= 5: Normal-Sleep Group (n=70);*

*MD: mean difference; t: t score; p: probability value; SD: standard deviation;*

*Conners' Adult ADHD Rating Scales (CAARS) as an index of attention deficit; Foreign Language Classroom Anxiety Scale (FLCAS)*

Sleep disturbances are frequently associated with anxiety and can comprise core features of anxiety disorders [15]. One review study reported that sleep disturbances or insufficient sleep affect about 50% of individuals with anxiety and can instigate or further exacerbate anxiety [16]. Language anxiety from ESL college students who are vulnerable to greater insomnia is an important influential factor to correlate with insomnia [17]. In the current study, EFL College Students with poor sleep quality assessed via PSQI>5 have more FLCAS-assessed foreign language learning anxiety than those with normal sleep quality, implying that poor sleep quality did negatively influence EFL College Students' foreign language learning anxiety.

Our major findings can be integrated into one novel summary: Poor sleep quality in EFL College Students with co-existed more attention deficits and higher foreign language learning anxiety did negatively influence English listening performance, but did not influence English reading performance. As to a conclusive result with learning performance, some studies directly disclosed that poor sleep quality was negatively associated with academic performance from middle school through the college years [1, 18, 19]. In contrast, our previous study showed that disordered sleep did not result in a poorer academic performance but poor attention in the primary school students [20]. In the context of foreign language performance, sleep deprivation has been proven to have negative effects on foreign language performance [21, 22] and sleep quantity affected specific types of EFL tasks [22]. Our major findings showed that poor sleep quality in EFL College Students have negative effects on attention deficits, higher foreign language learning anxiety, and English listening performance, but not English reading performance, which might be hypothesized that during listening, more attention is needed than during reading. Poor sleep quality can also influence students' cognition in learning. Although reading is also regarded as a receptive skill, it may not be affected by mild or moderate poor sleep quality if the testing time is long enough for students to retrieve answers from the printed text. It is still unclear whether severe poor sleep quality will impact English reading performance or not.

## 5. LIMITATION

There were some limitations in the current study. Due to 76 % of total 148 EFL College Student

participants are female, this study cannot tell the gender difference. Pittsburgh Sleep Quality Index (PSQI) (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989) was used in the current study to define general poor sleep quality subjectively. In the future, over-night polysomnography will be required to objectively observe sleep quality, such as percentage of deep sleep, severity of sleep apnea, number of arousals, and sleep efficacy. In the current study, Conners' Adult ADHD Rating Scales (CAARS) was used to measure the presence, severity and impact of attention deficit subjectively. In the future, computer-detected attention such as Conners' Continuous Performance Test will be required to objectively detect attention levels.

## 6. CONCLUSION

Poor sleep quality based on PSQI>5 in EFL College Students with co-existed more attention deficits and higher foreign language learning anxiety did negatively influence English listening performance, but did not influence English reading performance.

## ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

## CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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