

## Relationship between Stress and Sleep Bruxism Among Aircrew

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### Abstract

**Background:** Sleep bruxism is a parafunctional activity related to the sleep state. One of the causes is stress ("home stress" and the "effect of home stress on the occupation") in a work environment with a great amount of responsibility and high risk, such as an aircrew profession in a flight environment. However, research on stress and sleep bruxism on aircrews in Indonesia has not been done. This study aimed to analyze the relationship between stress and sleep bruxism on aircrews. **Methods:** Subjects consisted of 214 national airline aircrew from Indonesia. Subjects completed two questionnaires that were modifications of the Sloan and Cooper's questionnaire and a sleep bruxism questionnaire. This study took place in two stages. The first stage was a validation test and reliability modifications of the Sloan and Cooper's questionnaire, and the second stage was a cross-sectional test. **Results:** A Mann-Whitney test showed no significant relationship between home stress and age with sleep bruxism ( $p > 0.05$ ). An unpaired t-test showed that there was a significant relationship between the effect of home stress on the occupation and sleep bruxism ( $p < 0.05$ ). **Conclusion:** There was no significant relationship between home stress and sleep bruxism, but there was a significant relationship between the effect of home stress on the occupation and sleep bruxism on aircrews.

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### Introduction

Sleep bruxism is a parafunctional activity of the masticatory system related to a person's sleep state. Bruxism is derived from the Greek *brychein*, which means "gritted teeth".<sup>1</sup> The initial definition of bruxism is to grit and grind the teeth without any specific purpose. Barriers of occlusion have long been believed to be the cause of sleep bruxism. However, the results of studies from the last 15 years have shown that there has been a shift in the cause from peripheral factors (such as occlusion barriers and orofacial anatomy disorder) toward a central factor (neuropathophysiology and psychology).<sup>2,3</sup> As a result, the first therapy occlusion adjustment that is often done to protect the periodontal tissues from occlusal

forces and to eliminate sleep bruxism has been questioned. This was confirmed by the studies of Ommerborn et al. and Lobbezoo et al., which revealed that not all sleep bruxism has occlusal obstacles and not all subjects who have occlusal barriers suffer from sleep bruxism.<sup>3,4</sup>

Ommerborn et al., who analyzed the neurochemical processes, revealed imbalanced side striae D2 receptors in patients with sleep bruxism.<sup>3</sup> While, from a psychological approach, it has been revealed that stress factors play a significant role in triggering the occurrence of sleep bruxism, it can be concluded from the various results of the studies that sleep bruxism has a multifactorial etiology. Therefore, the therapies are mostly aimed at reducing the adverse effects of bruxism.<sup>1,3,5</sup>

Stress can be defined as a person's physical or emotional condition as a reaction to the demands of the environment that are considered to endanger or threaten the individual.<sup>6</sup> Such threats can affect the physiological and psychological integrity of the individual and result in a physiological and

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psychological response and/or behavior. The definition implies an input and output component, which is physiological or psychological.<sup>7</sup> Triggers of stress in individuals range from environmental, psychological, physiological, and so on. One of the environmental factors that are quite influential in triggering stress is the work environment, especially a work environment filled with risks and high responsibility, for example, the work environment involving flight, for example, that of an aircrew.<sup>8,9</sup> In a flight environment, some of the conditions that can lead to stress include temperature, a high working rhythm, noise and air communication, pain due to reduced air pressure, vibration, motion sickness, and others. Individuals who are continuously exposed to environmental conditions, thus, can have increased psycho-emotional tension. Therefore, being part of an aircrew is a job that has a high risk of experiencing stress.<sup>9</sup>

This is supported by the study of Jeeva and Chandramohan, which stated that the work of an aircrew has a high risk of stress.<sup>10</sup> Studies performed by Kaushik et al. and Lurie et al. stated that increased stress can cause sleep bruxism.<sup>8,11</sup> One method to assess the level of stress on aircrews is a modification of the Sloan and Cooper's questionnaire, which consists of a questionnaire on "home stress" to assess the level of stress experienced by the individual in the household and on the "effect of home stress on the occupation" to assess the extent of stress in households carried over into the individual work environment.<sup>12</sup> Study on stress and sleep bruxism on aircrews' work environment in Indonesia has not been done, but environmental conditions and the pressure of work in the aircrew profession have a significant effect on the physiological and psychological status, thereby increasing stress. One result of increased stress is the occurrence of sleep bruxism. Therefore, it is necessary to investigate the relationship between stress and sleep bruxism on aircrews in Indonesian airlines.

## Methods

This study consisted of two stages. First was the validation of a questionnaire that has never been used in Indonesia, and the second was a cross-sectional study. The subjects

consisted of 214 males and females, age 19–57 years, from Garuda Indonesia aircrew, who came to Garuda Sentra Medika Kemayoran in Jakarta and Health Center Flights in Jakarta, for a scheduled routine medical check up. The inclusion criteria were Garuda Indonesia aircrew who were still actively working, who were in a good general state, healthy, fit to fly, and willing to fill out questionnaires about stress and sleep bruxism. Exclusion criteria were subjects who were unwilling to fill out an informed consent. Tools and materials used were the informed consent and a data sheet consisting of a modified Sloan and Cooper's questionnaire<sup>12</sup> and a sleep bruxism questionnaire.<sup>13</sup>

Subjects who met all inclusion criteria were given an explanation about the aim of this study to establish good communication and cooperation. If the subject refused to participate in the study, the study was discontinued. When subjects were willing to participate, an informed consent sheet was provided to be filled out. After the retrieval of personal data, the subject filled out the occupational stress questionnaire (modified from the Sloan and Cooper's questionnaire)<sup>12</sup> and a sleep bruxism questionnaire.<sup>13</sup>

The data were analyzed using SPSS version 17 software and interpreted further. The data analysis stage included univariate analysis to determine the distribution frequency of each variable. Bivariate analysis was performed, namely the Mann–Whitney test for the analysis of variables for home stress with sleep bruxism and the variables for age with sleep bruxism, and the chi-square test to analyze the gender and work experience variable with the sleep and non-sleep bruxism variable.

## Results

Subjects consisted of 214 males and females, age 19–57 years, from Garuda Indonesia aircrew. Subjects filled out a stress questionnaire modified from the Sloan and Cooper's questionnaire, which consisted of a part on home stress and one on the effect of home stress on the occupation, and also filled out a sleep bruxism questionnaire. All data were then processed using SPSS 17. The distribution of data by gender, occupation, and sleep bruxism is shown in Table 1.

**Table 1** The distribution of subjects by gender, work experience, and sleep bruxism.

Variable	Total	%
Gender		
Male	170	79.4
Female	44	20.6
Work Experience		
a. Junior	163	76.2
b. Senior	51	23.8
Sleep bruxism		
Non-sleep bruxism	51	23.8
	163	76.2

Questionnaires used to determine the value of the stress included the modified Sloan and Cooper's questionnaire, which consisted of a portion on home stress (29 questions) and a portion on the effect of home stress on the occupation (12 questions). Before the data could be analyzed, a validity and reliability test for the questionnaire had to be performed because it had not been used in Indonesian society. The questionnaire's reliability was analyzed using Cronbach's alpha coefficients.

In each statement about home stress, the subject answered by giving a score of 1 = doesn't make me stressed, 2 = makes me a little stressed, 3 = makes me moderately stressed, 4 = makes me stressed, and 5 = makes me very stressed. Then, the score was added. After testing the validation and reliability, the Cronbach's alpha value was 0.959. Question No. 29 was removed, Cronbach's the alpha value became higher, at 0.960. Thus, from a total of 29 statements about home stress, only one statement was rejected, number 29 ("The potential to make a relationship outside marriage").

For questions on the effect of home stress on the occupation, the subject answered by giving a score of 1 = never, 2 = rarely, 3 = sometimes, 4 = usually, 5 = always. Then, the score value of each question was added. After testing the validation and reliability, the Cronbach's alpha value was 0.840. When question number 12 was removed, the value of

Cronbach's alpha increased to 0.844. Furthermore, if question number 10 was excluded, the Cronbach's alpha value increased to 0.846. After testing the correlation between items, the value of the Pearson correlation between questions did not exceed the Pearson correlation value from the total score of each question. Therefore, in the effect of home stress on the occupation, two questions were excluded, number 10 ("The tendency to talk about home problems at work") and a question number 12 ("The consumption of alcohol increase"). The results validated the modified Sloan and Cooper's questionnaire shown in Table 2.

Bivariate analysis was performed to determine whether there is a relationship between home stress, the effect of home stress on the occupation, age, gender, or work experience and sleep bruxism. The relationship between home stress and sleep bruxism was determined with the Mann-Whitney test, and the significance value was 0.061 ( $p > 0.05$ ). Therefore, it can be concluded that there was no significant difference between the mean score of home stress in the sleep bruxism and non-sleep bruxism groups (Table 3). The relationship between the effect of home stress on the occupation and sleep bruxism was analyzed using an unpaired t-test, and the significance value was 0.015 ( $p < 0.05$ ). Therefore, it can be concluded that there was a significant difference between the mean score in the sleep and non-sleep bruxism groups, where the score for the effect of home stress on the occupation for the sleep bruxism group ( $23:39 \pm 5.50$ ) was higher than for the non-sleep bruxism group ( $21:29 \pm 5:24$ ).

The result of the Mann-Whitney test showed no significant difference between age and sleep bruxism and non-sleep bruxism ( $p = 0.911$ ) (Table 4). The result of the chi-square test showed no significant difference between gender ( $p = 0.073$ ) and work experience ( $p = 0.954$ ) (Table 4).

**Table 2** Results of the validation modifications of Sloan and Cooper's questionnaire

No	Variable	Correlation between items to total
I.	Duties, responsibilities, and things that must be done	0.581
	Different opinions, discord, and disagreement	0.589
	Lack of money	0.713
	Disappointed because of something that does not reach expectations	0.675
	Issues related to children	0.685
	Other people do not obey or things are not going well	0.717
	Success or failure in the work that I have done	0.552
	Life at home makes me happy	
	Continuous and permanent disruption	0.632
	"Like" to take and spend time at home	0.682
	Conflict of interest, resulting in compromise	0.708
	Achieved personal purpose and dream	0.789
	Quality of bond with partner	0.731
	New experience and not usual	0.705
	Domestic situation that is not good	0.662
	Worried about other people	0.667
	Can't identify problem	0.720
	No peace, stability, and dependence	0.658
	Interpersonal relationship	0.734
	Good social environment at home	0.801
	The inability of the couple to meet their needs	0.732
	Lack of understanding from partner about work	0.687
	Dependency on partner and their ability	0.687
	Responsible for the home activities	0.697
	Family health	0.759
	Anxiety of family members when it's time to fly	0.73
Not having someone to talk to about the job	0.736	
Responsibility for the role in the family	0.606	
	0.735	
II.	Feeling tired because of disturbed sleep	0.550
	The tendency to feel anxious	0.670
	Daydreaming during low workload	0.705
	Slowing me	0.718
	Want to be free from task	0.591
	Decreased concentration	0.699
	The tendency to not listen carefully	0.651
	Making mistake without knowing why	0.637
	Making mistake that can be avoided	0.583
	Decline in the quality of preparation before flying	0.655

**Table 3** The relationship between home stress and age with sleep bruxism

Variable	Sleep bruxism		Non-sleep bruxism		p
	n	mean rank	n	mean rank	
Home stress	51	121.65	163	103.07	0.061
Age	51	108.34	163	107.24	0.911

\*Mann-Whitney test

**Table 4** The relationship between gender and work experience with sleep bruxism.

Variable	Sleep bruxism		Non-sleep bruxism		p
	n	%	n	%	
Gender					0.73
Male	36	16.82	134	62.62	
Female	15	7.01	29	13.55	
Work Experience					0.95
Junior	39	18.22	12	5.60	
Senior	124	57.94	39	18.22	

\*Chi-square test

### Discussion

This study was an analytic study with cross-sectional design that aimed to analyze the relationship between stress and sleep bruxism on aircrews. Advantages of the design of this study was the feasibility of examining multiple variables at once. It could be used as a basis for further study that is more conclusive and may be used as the subject for study of the general public. It was relatively easy and economical and obtained quick results. The drawback was that the cause-and-effect variables could not be determined and required a large number of subjects.<sup>14</sup>

Subjects were aircrews of a commercial Indonesian airline. The aircrew consisted of pilots and flight attendants who were still actively working with an age range of 19–57 years. Selection of aircrew as a subject was based on the rating of aircrew as one of the jobs with a high level of risk that can lead to stress and bruxism.<sup>8,10</sup>

To determine the level of stress on aircrews, questionnaires were used as a measuring instrument (home stress and the effect of home stress on the occupation, using a modified Sloan and Cooper’s questionnaire). The Sloan and Cooper’s questionnaire was considered quite accurate, systematic, and modest in assessing the psychosocial aspects of stress, but it was necessary to test the validation and reliability of the questionnaire because it had never been used in Indonesian society. This questionnaire was first used by Sloan and Cooper in 1986 on an aircrew in the United Kingdom and was extensively used in the study.<sup>12</sup>

The homes stress portion of the questionnaire consisted of 29 questions, and after the validity and reliability test was

performed, it ultimately contained 28 of the questions. The question excluded from the home stress questionnaire was “The potential to make a relationship outside marriage”. The problem was that the specific issue is uncommon to talk about; therefore, the answers were given less in accordance with the actual conditions.

The portion of the questionnaire about the effect of home stress on the occupation consisted of 12 questions. After the validity and reliability test, only 10 questions remained. “The tendency to talk about home problems at work” was one of the questions excluded because it is seen as taboo in Indonesian society to discuss household conditions in the workplace. Another question that was excluded from this questionnaire was “increased alcohol consumption” because the consumption of alcohol is not a common lifestyle in Indonesian society.

The sleep bruxism questionnaire used in this study was based on the diagnostic criteria of the American Academy of Sleep Bruxism.<sup>13</sup> From a total of 214 subjects, 51 (23.8%) were categorized into the sleep bruxism group and 163 (76.2%) into the non-sleep bruxism group. The prevalence of sleep bruxism, according to Lavigne et al., occurs in about 20% of the adult population.<sup>2</sup> The results of this study are higher when compared with Winocur et al.’s study, which found that, of the total respondents, only 14% are categorized as having sleep bruxism.<sup>13</sup>

However, the study conducted by Carvalho et al. stated that the prevalence of bruxism is as much as 50.25%.<sup>15</sup> Differences in the prevalence of bruxism in this study with other studies likely are due to the gauge and different research methodologies. In this study, a questionnaire used as the measuring instrument was based on the diagnostic criteria

of the American Academy of Sleep Bruxism.<sup>13</sup> Several kinds of measuring instruments used in other studies include anamnesis, clinical examination, intraoral appliances, inspection of electromyography (EMG), and polysomnography (PSG).<sup>5</sup>

Advantages of the use of the questionnaire were the complete, systematic, and same questions for all subjects, although there were some questions that were sometimes poorly understood or less in accordance with the conditions and situation of the research subjects. For example, for the first question in the questionnaire concerning sleep bruxism, "Do you consciously, or anyone else, hear you perform tooth grinding at night?", subjects did not necessarily understand the term "tooth grinding", so it needed further explanation. In addition, some subjects did not sleep with family members, so the answers given were less precise.<sup>16</sup> Similarly, for the question "Do you consciously know that the state of your teeth is malformed?", subjects did not understand the form of malformed teeth.

This study did not use measuring tools such as clinical examination, intraoral appliances, and electromyograph due to the time constraints of the subjects. Study using those instruments required more than one visit, and the work schedules of the aircrew were irregular and they had various hours of flying that could have complicated the course of the study.

The results of the analytical hypothesis test between two unpaired variables were the effect of variable stress (home stress and the effect of home stress on the occupation) on sleep bruxism in aircrews. The conclusion was that there was no relationship between home stress and sleep bruxism in aircrews, but there was a relationship between the effect of home stress on the occupation and sleep bruxism in aircrews. The value score for the effect of home stress on the occupation was higher in the sleep bruxism group than the non-sleep bruxism group. Stress experienced by a person will affect the quality of one's sleep.<sup>10,11</sup> The quality of interrupted sleep can cause a stimulus response (arousal), and the side effect of these responses is the occurrence of sleep bruxism.<sup>2</sup> Research conducted by Winocur et al. and Carvalho et al. supports the conclusion that increased stress has a strong correlation with

the occurrence of sleep bruxism.<sup>13,15</sup> However, in another study, Pierce et al. have found that the relationship between stress and bruxism activity is very weak,<sup>17</sup> due to different mechanisms by which stress (coping) are different in each individual.

The pilot profession is a job with a high level of risk that potentially can cause considerably high stress.<sup>10</sup> In addition to having a high risk factor, pilots fly long and irregular hours, which is also one etiology of the increased stress. Ahlberg et al. support the conclusion that long and irregular working hours can cause fatigue and degrade performance, thus affecting the quality of sleep.<sup>18</sup> These conditions are a trigger factor of sleep bruxism.<sup>19</sup>

In this study, there was no significant difference among age groups for non-sleep bruxism and sleep bruxism. These results are consistent with Winocur et al., Girarki et al., and Ahlberg et al., who stated there are no significant differences between age groups and non-sleep bruxism and sleep bruxism.<sup>13,20,21</sup> However, this is contrary to research by Nakata et al., who stated that bruxism has a negative correlation with age.<sup>16</sup>

There was no significant relationship between gender and sleep bruxism in this study. Ahlberg et al., though, stated that sleep bruxism was more common in females than in males.<sup>22</sup> However, Nakata et al. stated that men had a 1.5 times higher prevalence compared to women of having sleep bruxism.<sup>16</sup> Differences in these results are probably influenced by several factors, such as stress, smoking habits, and lifestyle differences between men and women.

In this study, it was concluded that there was no significant relationship between the work position/experience (junior or senior) and sleep bruxism for aircrews. Junior and senior was specified by the airline by long hours of flying and performance.

The aircrews as subjects were not grouped into the cockpit crew and cabin crew because, among the subjects, the cockpit crew were all male and the cabin crew were all female. The weakness of this study is the current primary data collection and the limited time the subjects had to fill out the questionnaire. Researchers noted that, at the time of the questionnaire, the subjects examined were among aircrew who were being

scheduled by the airline to carry out routine medical examinations, which included a general examination, teeth and eye exams, and electrocardiography, treadmill, radiology, and laboratory tests and others. Hence, there was a possibility that the subjects were less precise when filling out the questionnaire due to a lack of concentration while answering and a lack of understanding the intent, even though, at the time of filling out the questionnaire, the subjects were accompanied by researchers. In addition, questionnaire answers may be biased because the subject may be less likely to remember the condition described in the question, or the subject was less sensitive to the conditions.

### Conclusion

There was no significant relationship between home stress and sleep bruxism, but there was a significant relationship between the effect of home stress on the occupation and sleep bruxism on aircrews. There was no significant relationship between age, gender, or occupation and sleep bruxism in the aircrew.

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