Common Mental Disorders Among Civil Aviation Pilots

Denise Feijó, Ronir Raggio Luiz, and Volney Magalhães Camara

Feijó D, Luiz RR, Camara VM. ***Common mental disorders among civil aviation pilots*****. Aviat Space Environ Med 2012; 83:509–13.**

Introduction: The purpose of this study was to estimate the prevalence of suspected cases of common mental disorders (CMD) on Brazilian civil aviation pilots and to investigate associations between CMD, demographics, and labor variables. ***Methods:*** A quantitative cross-sectional study was conducted on 807 working pilots between October 2009 and October 2010 using a self-administered questionnaire to obtain sociodemographic data and information about workload. CMD prevalence was estimated with the Self-Reporting Questionnaire-20 items (SRQ-20). Multiple logistic regression was used in statistical data analyses. ***Results:*** The overall prevalence of CMD was 6.7% with the cutoff point of 8 used in this study, i.e., scores greater than or equal to 8 in SRQ-20 define positive cases. Using alternative cutoffs, the prevalence was 9.2% (cut off point 7) or 12% (cutoff point 6). Among the individuals who did not exercise, 10.2% presented suspected CMD. Among those with a heavy workload, 23.7% presented scores indicating suspected CMD. Only variables relating to workload and the practice of physical activity were significantly correlated with the estimate of CMD after multivariate analysis. Regular physical exercise afforded a possible protective effect against suspected cases of CMD, while there was a higher prevalence of suspected cases among subjects with heavy workloads. ***Discussion:*** The inclusion of the topic of mental health among the targets and priorities of civil aviation in Brazil is imperative. Addressing issues such as the regular practice of physical activity and workload can contribute to achieving a better balance between flight safety and productivity.

Keywords: mental health, aviators, flight crew, SRQ-20.

COMMON MENTAL disorders (CMD), also known as minor psychological disorders, are the least severe and most frequently occurring mental disorders. They include nonpsychotic depressive symptoms, anxiety, somatic complaints (headache, lack of appetite, tremors, and poor digestion), difficulty in concentrating and making decisions, forgetfulness, insomnia, fatigue, irritability, and feelings of uselessness (11). They present proven associations with variables relating to living conditions and occupational structures (16), and may either be transitory or long lasting, but they are rarely fatal (20).

Presentation of a CMD does not imply a formal psychiatric diagnosis, but it has enormous costs in terms of psychological distress and the impact on relationships and quality of life. CMD compromise performance in daily activities and constitute an important cause of sick leave from work, demand for healthcare services, and economic losses. They are a potential substrate for the development of more severe disorders (9,27).

The impact of work on mental health has been investigated in relation to several professional categories, but no data on CMD and the specific working conditions of aircrew are available in the literature. The profession of airline pilot is an activity that involves multiple operating levels and interlinked tasks, some with a high level of complexity and subject to many occupational stress factors (23). The general guidance for prevention of aeronautical accidents is the premise that the only acceptable accident rate is zero, given that this is not just a matter of economics, but rather a humanitarian issue, considering that human lives do not have a price.

A recent study (7) comparing the results from aeronautical accident investigations of Brazilian general aviation by the Aeronautical Accident Investigation and Prevention Center (CENIPA) that took place between 2000 and 2005 showed that the main contributory factors observed in the analysis models were "deficient judgment" and "decision error," and the main factor was operator errors (i.e., by pilots). According to the International Civil Aviation Organization (13), the concept of the human factor relates to studies on human capacities and limitations provided by the workplace. It consists of studying human interactions in situations of work and life. In aviation, it is important to emphasize that human limitations need to be studied so that a balance can be attained between flight safety and productivity, given that organizational factors can be considered an important source of pressure on pilots (2).

The act of piloting an airplane requires precise control over a complex system (14). During a flight, in addition to the primary tasks (flight, navigation, and communication), pilots have to plan their activities, supervise the status of the system, and anticipate future tasks (22). Pilots' mental workload is high because of the large quantity of information that needs to be processed (5). The tasks required have to be carried out in combination with a wide variety of stimuli, including visual, auditory,

From the Instituto de Estudos em Saúde Coletiva da Universidade Federal do Rio de Janeiro (IESC/UFRJ), and the Institute for Collective Health Studies of the Federal University of Rio de Janeiro (IESC/UFRJ), Rio de Janeiro, Brazil.

This manuscript was received for review in September 2011. It was accepted for publication in January 2012.

Address correspondence and reprint requests to: Denise Feijó, Rua Lauro Muller, 16/401 Botafogo, Rio de Janeiro RJ 22290-160, Brazil; denisepsiq@hotmail.com.

DOI: 10.3357/ASEM.3185.2012

and environmental information coming from inside and outside the airplane. Thus, piloting airplanes demands a high level of cognitive activity while dealing with various stress factors (14) such as time pressure and threats to safety. The workload is often high and includes night shifts, and has a high level of responsibility for safety in an environment in which mistakes may have disastrous consequences. Moreover, a series of other environmental and organizational factors may directly affect pilots' performance.

Concerning the aeromedical contribution to safety, as in other countries, we observed that during our pilots′ routine periodic reexaminations, relatively little formal attention is given to mental and behavioral problems such as anxiety and depression (6); rather, the emphasis is usually placed on the detection of physical disease. In order to address mental issues, the objectives of the present study were to estimate the prevalence of suspected cases of CMD among civil aviation pilots by using the Self-Report Questionnaire–20 items (SRQ-20) psychiatric screening tool and to investigate possible associations between the presence of suspected cases of CMD and sociodemographic and labor variables.

METHODS

Subjects

The study protocol was approved by the Research Ethics Committee of the Institute for Collective Health Studies of the Federal University of Rio de Janeiro (IESC/UFRJ). The study was registered in SISNEP/CEP/CONEP under the number CAAE-0017.0.239.000-09. All subjects were required to sign an informed consent statement before they could participate in the study.

Commercial pilots and airline pilots were considered to be eligible to participate in the study when they came for a health inspection in order to revalidate their physical capacity certificate at the Aerospace Medicine Center (CEMAL) between October 2009 and October 2010. Pilots who were on medical leave and those who were undergoing their first medical examination (i.e., just starting their career) were not included. These restrictions were included to ensure that we were studying working pilots, not beginners or aspirants.

Procedures

This was a 1-yr quantitative cross-sectional study that used a self-administered multidimensional questionnaire to gather sociodemographic and labor data, as well as the SRQ-20. Participation in the study was voluntary, anonymous, and administered only once for each participant. Questionnaires were handed out to the participants every working day that the assessment center was functioning. At the start of the health inspection, the questionnaire and the consent statement were handed over, and appropriate explanations regarding the study were provided verbally. The written document included a summary of the reason for the project, explaining the risks, costs, benefits, and alternatives and highlighting the voluntary nature of participation and the assurance of anonymity and confidentiality. The participants were instructed to hand in the completed questionnaire at a specific location in the organization's central lobby.

SRQ-20

The SRQ-20 is a screening tool for CMD that is currently recommended by the World Health Organization (WHO) (26) for clinical and research use because of its low cost, easy comprehension, and rapid completion. It contains 20 questions with yes/no responses and each affirmative response is given a score of one point. Examples of questions from the SRQ-20 include: Do you often have headaches? Do you feel nervous, tense, worried? The final score is obtained by summing these scores and gives an indication of whether a CMD can be suspected. The SRQ-20 was dichotomized, independent of gender, at the cutoff point of 8 chosen for this investigation; this means that with 8 or more positive answers, we considered this a suspected case of CMD and we also analyzed the data using two alternative cutoff points of 7 and 6 in order to maintain comparability between studies.

The following variables were also gathered objectively as self-reported information (**Table I**): sex, age, monthly income, regular practice of physical exercise, length of time since qualifying as a pilot, children, marital status, type of airplane piloted, previous involvement in any aeronautical accident or incident, involvement with religious faith, number of rest days per month, and number of rostered flying hours per month. From the responses relating to the last two variables, we created a new variable that we call workload, which was categorized as heavy workload (less than or equal to 8 rest days per month and more than 80 flying hours per month), light workload (greater than or equal to 10 rest days per month and fewer than 70 flying hours per month), and intermediate workload (all situations between the definitions of heavy and light workloads).

Statistical Analysis

The data were analyzed using the Statistical Package for the Social Sciences software (version 17.0, SPSS, Chicago, IL). Univariate and multivariate logistic regression was used in which the dichotomous score from the SRQ-20 was taken to be the dependent variable and representative of the presence or absence of suspected cases of CMD. Only variables that separately showed associations of $P \leq 0.20$ were included in the multiple logistic regression model for analysis adjusted with all the variables simultaneously. In the final regression model, only the variables showing $P \leq 0.05$ were considered to be statistically significant.

RESULTS

In total, 807 pilots filled out the SRQ-20 and were evaluated. The mean final score of the SRQ-20 was 1.91 (SD = 2.83), with a median of 1 (quartile Q25 = 0; Q75 = 3). **Fig. 1** shows the different prevalences of suspected cases of CMD according to the different cutoff points, with the confidence interval relating to each

TABLE I. DISTRIBUTION OF SOCIODEMOGRAPHIC AND LABOR VARIABLES, WITH THE PREVALENCE OF SUSPECTED CASES OF CMD AND THE ASSOCIATION OF THOSE VARIABLES WITH CMD, BRAZIL, 2010.

	Distribution	Prevalence	Logistic Models	
			Crude Model	Final Model
Variable (total number of individuals analyzed*)	Total Number of Individuals	Suspected Cases of CMD	OR (*P*)	OR (*P*)
	N (%)	*N* (%)		
Sex (*N* = 755)				
Male	742 (98.3)	49 (6.6)	1	
Female	13 (1.7)	1 (7.7)	1.17 (0.876)	
Age group (*N* = 800)				
≤ 35 yr	176 (22.0)	8 (4.5)	1	
> 35 yr	624 (78.0)	45 (7.2)	1.63 (0.213)	
Monthly income in reals/USD (*N* = 802)				
Up to 5000/2835	118 (14.7)	4 (3.4)	1	
More than 5000/2835	684 (85.3)	49 (7.2)	2.19 (0.137)	
Regular practice of physical exercise (*N* = 802)				
Yes	489 (61.0)	22 (4.5)	1	1
No	313 (39.0)	32 (10.2)	2.41 (0.002)	2.31 (0.005)
Length of time since qualifying as a pilot (*N* = 800)			(0.075)	
Up to 10 yr	166 (20.8)	5 (3.0)	1	
11 to 20 yr	172 (21.5)	16 (9.3)	3.30 (0.023)	
More than 20 yr	462 (57.8)	32 (6.9)	2.39 (0.074)	
Number of children (*N* = 803)				
None	201 (25.0)	11 (5.5)	1	
1 or more	602 (75.0)	43 (7.1)	1.32 (0.414)	
Conjugal situation (*N* = 802)				
With a steady partner	678 (84.5)	47 (6.9)	1.24 (0.600)	
Without a steady partner	124 (15.5)	7 (5.6)	1	
Workload (*N* = 769)(using no. of rest days/month and no. of flying hours/month)			(< 0.001)	< 0.001
Heavy (rest days ≤ 8; flying hours > 80)	59 (7.7)	14 (23.7)	9.23 (< 0.001)	8.49 (< 0.001)
Intermediate	526 (68.4)	33 (6.3)	1.98 (0.129)	1.97 (0.133)
Light (rest days ≥ 10; flying hours < 70)	184 (23.9)	6 (3.3)	1	1
Type of airplane currently flown (*N* = 802)				
Rotary wing	164 (20.4)	7 (4.3)	0.56 (0.163)	
Fixed wing	638 (79.6)	47 (7.4)	1	
Previous involvement in aeronautical accident or incident (*N* = 805)				
Yes	163 (20.2)	12 (7.4)	1.13 (0.709)	
No	642 (79.8)	42 (6.5)	1	
Involvement with religious faith (*N* = 800)				
Non-practicing or atheist	536 (67.0)	38 (7.1)	1.18 (0.586)	
Practicing	264 (33.0)	16 (6.1)	1	

* The total number of individuals analyzed in relation to each variable differs and is lower than the total number of individuals in the study (*N* = 807) because of failure to fill in the information relating to certain variables in the questionnaire.

point. This study used the cutoff point of 8 for both sexes and found a prevalence of 6.7%. Other studies have used a cutoff point of 7 (1,8,18,21,25) or 6 (e.g., 9 and 17), and if these cutoff points were applied to the data of the present study, the prevalences would be 9.2% or 12%, respectively.

Table I presents the distribution of the sociodemographic and labor variables together with the prevalences of suspected cases of CMD. It can be seen that male gender was highly predominant (98.3%), with only 13 women participating in this study. The majority (78%) were over 35 yr of age. The monthly income of the majority (85.3%) was greater than 5000 reals or $2835 USD. The individuals' mean age was 45.56 yr, with a range from 20 to 75 yr (quartile Q25: 37.25 yr; quartile Q50: 46 yr, quartile Q75: 54 yr). We note that 415 individuals (51.7%) earned more than 10,000 reals or $5671 USD per month (data not shown).

Most of the individuals (61%) said that they practiced physical activity regularly. The majority of the participants were qualified as a pilot more than 20 yr previously (57.8%), while 21.5% had qualified between 11 and 20 yr previously and 20.8% less than or equal to 10 yr previously. Most of those surveyed were in a steady relationship (84.5%) and had one or more children (75%). Our population included 59 individuals with a heavy workload (7.7%) and 184 (23.9%) with a light workload, while the majority, i.e., 526 individuals (68.4%), had an intermediate workload.

The majority of the pilots flew fixed-wing airplanes (79.6%). Previous involvement in aeronautical accidents or incidents was reported by 20.2% of the participants. Regarding religious beliefs, we found that only 33% actively practiced their religion, while the remainder was atheist or non-practicing.

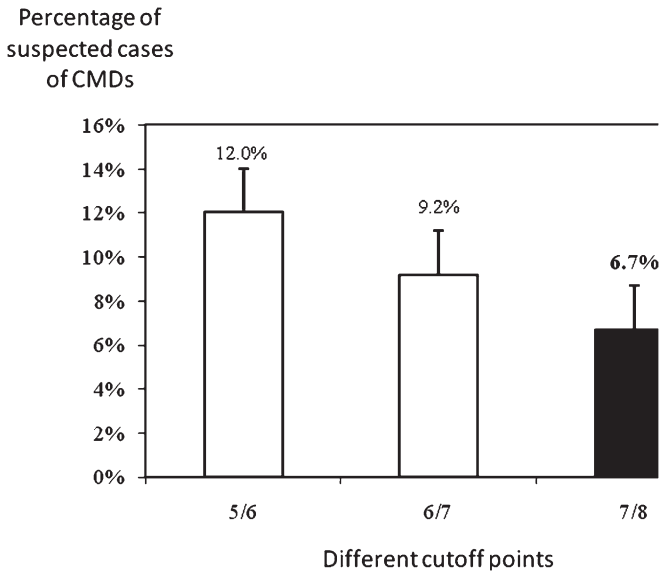

Fig. 1. Prevalence of suspected cases of CMD with different cutoff points.

In relation to the specific prevalences of CMD, our attention was drawn to the variables of workload and regular practice of physical exercise. Among the individuals who did not exercise, 10.2% presented suspected CMD. Among those with a heavy workload, 23.7% presented scores indicating suspected CMD (Table I).

Table I also shows an association between presence of suspected cases of CMD and the sociodemographic and labor variables. Initially, four variables drew our attention because of their magnitude (OR) or statistical significance (*P*-value), both in the crude analysis and in the analysis adjusted using all the variables simultaneously: monthly income, length of time since qualification, regular practice of physical activity, and workload. However, in the final adjusted model, only workload ($P = 0.005$) and regular practice of physical activity ($P < 0.001$) maintained statistically significant associations.

The expected CMD prevalences for the variables that were considered statistically significant in the final adjusted model were obtained using the logistic regression model. Individuals who practiced physical exercise regularly and had a light workload had the expected prevalence of suspected cases of CMD of 2.2%. The subgroup with a heavy workload that did not do physical activity regularly presented a predicted prevalence of suspected cases of CMD of 31%.

DISCUSSION

The prevalence of suspected cases of CMD found in our study (6.7%, with a cutoff point of 8) can be considered to be low when compared with other professional categories and with studies on the general population. However, occurrences of CMD have vital importance with regard to the human factor in flight safety. Although the SRQ-20 is commonly used, comparisons among results from different studies on the prevalence of suspected cases of CMD are impaired because the cutoff point chosen varies from one study to another. With the aim of minimizing this discrepancy, our study also presents the results according to the cutoff points most used. Choosing higher cutoff points increases the specificity of the study.

The study that validated the SRQ-20, which was conducted by Mari and Williams in 1986 (17), found sensitivity of 83% and specificity of 80% with different cutoff points according to gender: 6 for men and 8 for women. Recently, a study designed to update the SRQ-20 as a screening tool for CMD was conducted in Brazil, in which the SRQ-20 was compared with structured psychiatric interviews using the Structured Clinical Interview for DSM Disorders, which is based on the current version of the Diagnostic and Statistical Manual of Mental Disorders, 4th ed., Text Revision (DSM-IV-TR). The optimum cutoff point was taken to be 8, independent of sex, meaning that total scores less than 8 defined negative cases and total scores greater than or equal to 8 defined positive cases. For this cutoff point, the sensitivity found was 86.33% and the specificity was 89.31%, with positive and negative predictive values of 76.43% and 94.21%, respectively (12).

In studies on physicians, the prevalence of CMD was found to range from 17.5 to 32% in a study conducted in Recife (3) and it was 26% in another study in Salvador (18). Other professions reveal a diversity of CMD prevalences: prison wardens 30.7% (8), civil police officers 15.1 to 22.1% (24), nurses 20% and nursing auxiliaries 36.4% (1), and teachers 44% (20) to 55.9% (21). In studies conducted among truck drivers in a hauling company in the southern and southeastern regions of Brazil (26), a prevalence of CMD of 6.1% was observed (cutoff point of 7). Another study on the same type of worker (4) found a prevalence of CMD of 33% (cutoff point of 6).

Attention to human factors may raise the efficiency, productivity, and safety within the aeronautical environment; these improvements translate into cost control and continuous safety (13). Our study indicated that regular physical activity was associated with a lower risk of CMD and a positive linear correlation was observed in relation to the labor variable, since the heavier the workload, the greater the chance of a presenting CMD. In a study on truck drivers, an association between long working days and CMD was observed (25). The long distances traveled by truck drivers, their nighttime working hours, and the fact that they often have to stay in a different city, away from their homes and deprived of their social and family lives, are characteristics shared with airplane pilots that may cause harm to mental health (15).

It can be suggested that introducing changes in these variables may improve the mental health of this population. Among the possibilities, we could cite efforts to promote the practice of physical activities among airplane pilots, including policies to facilitate exercise, such as only staying overnight in hotels with gym facilities and holding health promotion activities within airline companies (talks and surveys). In association with this, it would be opportune to take a new look at the legislation

and policies relating to airline companies with regard to the limits on the number of flying hours and the number of rest days per month, since work overloads are strongly related to the appearance of suspected cases of CMD.

We conclude that physical exercise and workload may influence mental health. The literature appears to be generally supportive of the beneficial effects of physical activity and exercise on mental health (10,19). The potential of exercise in promoting mental health deserves investigation; further research is necessary to accurately determine the best frequency, intensity, time, and type/mode of physical activity necessary to benefit working pilots. Additional population-based longitudinal studies are needed to further explore the associations between psychiatric diagnosis and other variables in the theoretical model. Among the most important limitations of the study is the fact that the prevalence of CMD was given by a subjective screening instrument and not the gold standard (psychiatric interview).

ACKNOWLEDGMENTS

To the management of CEMAL for authorizing this study and to all the pilots who collaborated in some way with the study.

Authors and affiliations: Denise Feijó, M.Sc., M.D., Aerospace Medicine Center, CEMAL, Brazilian Air Force, Rio de Janeiro, Brazil; and Ronir Raggio Luiz, M.Sc., Ph.D., and Volney Magalhães Camara, Ph.D., Post-Doctoral Fellow, Institute for Collective Health Studies of the Federal University of Rio de Janeiro, Rio de Janeiro, Brazil.

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