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# The relationship of safety climate and psychological well-being with Indonesian civil pilots' safety behavior

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**Abstract.** Safety behavior is very important in reducing occurrence of aviation accidents. The relationship of safety climate and psychological well-being with Indonesian civil pilots' safety behavior. This was a cross-sectional study using the consecutive sampling technique that queried on safety climate, psychological well-being and safety behavior. Data were analyzed with multiple linear regression. Both alone and together, safety climate ( $\beta = 0.646$ ) and psychological well-being ( $\beta = 0.231$ ;  $p = 0.044$ ) were positively and significantly related to safety behavior. Safety climate and psychological well-being simultaneously had a positive and significant impact on the Indonesian civil pilots' safety behavior, with  $R^2 = 0.742$  and  $p$ -value  $\leq 0.001$ . Even so, the safety climate had a more dominant impact on the safety behavior than the psychological well-being.

## 1. Introduction

Studies conducted around the world have found that the greatest cause of aviation accidents is human or flight crew error. The human error factor accounted for the 66% of the aviation accidents from 1959 to 1985, but decreased to 58% from 1986 to 1995 and to 55% from 1996 to 2005. In other words, for the 47-year period from 1959 to 2005, the main cause of aviation accidents was human error, at approximately 59.7% [1].

Numerous studies have accidents to safety behavior, safety climate and psychological well-being. Studies conducted by Griffin and Neal [2]. Hayes et al. [3] Hofmann and Stetzer [4] and Rundmo [5] proved that safety climate related positively to safety behavior and both these factors related negatively to accidents. Clarke's study [6] showed that organizational and psychological factors could influence risk behavior for workplace accidents; safety climate had a major impact on safety behavior.

A study by Pousette et al. found that safety climate could significantly predict safety behaviour months later [7]. Meanwhile, Cooper and Phillips's study [8] found that safety climate and safety behavior were related and that safety climate affected the employees' safety behavior in reducing occupational injuries [9]. According to Griffin and Neal [2], the relationship between safety climate



and safety behavior could be conceptualized work performance theories, that is, safety climate was a precursor to safety behavior.

Another factor related to or affecting safety behavior is psychological well-being. Couto et al. found that the employees' high resilience was associated with high psychological well-being [10]. Conversely, high stress was associated with low psychological well-being. Other studies from occupational stress literature and a study by Kerr suggested that poor psychological well-being in the work environment might lead to stress and decreased safety behavior.

So far, Indonesia has been classified as having relatively frequent fatal aviation accidents, accounting for nearly a third of such accidents in Asia [11]. During the last decade, Indonesia's number of aviation accidents was among the highest in Asia—3.1 per million departures. Worldwide, however, the average number of aviation accidents reached only 0.25 per million departures [12].

Despite several studies on safety climate and safety behavior, no standard measurement of both variables was carried out until now. Thus, a valid, accurate and practical measuring instrument is needed for aviation safety climate and safety behavior in Indonesia. Study of aviation safety in Indonesia is important because the potential of civil aviation in Indonesia is great and increasing. Thus, this study analyzed the relationship of safety climate and psychological well-being with safety behavior.

## 2. Methods

The study used a cross-sectional design and was conducted at the Aviation Medical Center in Jakarta from 2017. All Indonesian civil pilots with CPL (Commercial Pilot License) or ATPL (Airline Transport Pilot License) pilot aviation certificates the target population—8,000 people. The sample was the consecutive sampling technique from the on-site population at the time of the study (respondents who came and met criteria) until the required number of samples ( $N = 137$ ) was met. The primary data was obtained through a multi-faceted questionnaire: The safety climate questionnaire contained 48 items, statements adapted from eight dimensions of the safety climate variable. The psychological well-being questionnaire contained 18 items, statements adapted from six dimensions of the psychological well-being variable. Finally, the safety behavior questionnaire contained 24 items, statements adapted from six dimensions of the safety behavior variable. The questionnaire's validity was analyzed with the product moment correlation formula. The results of the safety climate, psychological well-being and safety behavior questionnaire validity tests was that all items were valid, having a value of  $r_{\text{count}} > r_{\text{table}}$  (0.27) with Cronbach's alphas of 0.94, 0.79 and 0.88, respectively. Thus, all questionnaire items were valid for use. Data were analyzed with multiple linear regression with the help of IBM SPSS version 23.

## 3. Results

Data collection was conducted from May 29 to June 10, 2017, at the Aviation Medical Center in Jakarta, where the study respondents were 137 civil pilots (see Table 1). Respondents' ages ranged from 19 to 59 years, with ranging from 25 to 59 years. Their range of flight hours was 120–22,000.

**Table 1.** Demographic factors of civil pilots ( $N = 137$ )

Factors	N	%	Min	Max	Mean	Standard Deviation
Age						
19–24 years	32	23.3	19	59	32.4	9.6
25–59 years	105	76.6				
Total of Flight Hours						
<3000 hours	69	50.4	120	22.000	5,183.4	5,375.3
≥3000 hours	68	49.6				

The safety climate, psychological well-being and safety behavior of pilots can be seen in Table 2.

**Table 2.** Safety climate, psychological well-being and safety behavior (N = 137)

Factors	Range	N	%	Min	Max	Mean	Standard Deviation
<b>Safety Climate</b>							
High	>271	33	24.1				
Moderate	224–271	79	57.7	194	285	248	23.7
Low	<224	25	18.2				
<b>Psychological Well-Being</b>							
High	>100	25	18.2				
Moderate	81–100	86	62.8	70	106	90.8	9.49
Low	<81	26	19.0				
<b>Safety Behavior</b>							
High	>136	28	20.4				
Moderate	111–136	87	63.5	93	143	123	12.7
Low	<111	22	16.1				

The results of the bivariate analysis showed that age, psychological well-being and safety climate factors had a p-value of <0.25, but the flight hours factor had a p-value of >0.25; therefore, the three variables of safety behavior were included in the multivariate analysis.

**Table 3.** Dominant variables of safety behavior

Variables	$\beta$	T count	P	R <sup>2</sup>	F count	P
Safety Climate	0.646	5.693	$\leq 0.001$			
Psychological Well-Being	0.231	2.035	0.044	0.742	127,221	$\leq 0.001$ *
Age	-0.015	-0.327	0.744			

\*p<0.05

Table 3 shows both safety and psychological well-being variables simultaneously positively and significantly impacted safety behavior. The contribution of safety climate and psychological well-being towards safety behavior can be seen from the R<sup>2</sup> value of 0.742 (74.2%), indicating that the variance of the safety behavior can be explained by the safety climate and psychological well-being variables at about 74.2%, while the rest could be explained by other variables such as age.

#### 4. Discussion

This study's results showed that safety climate had a positive, significant impact on the safety behavior variable. As the pilots' safety climate increased, their safety behavior also increased. A high-quality safety climate caused pilots to be more disciplined and follow safety procedures that later made them behave in a safety-oriented manner. These findings illustrate that pilots' safety climate—as measured by management, safety systems, safety procedures, safety training, risks, communications, resources and operations personnel dimensions—has a significant effect on the pilots' safety behavior as measured by these following procedures: using protective equipment, practicing risk reduction, communicating, implementing these procedure properly and initiating safety-related change

dimensions. Indeed, several studies have proven that safety climate related positively with safety behavior [3,4,5].

The results also showed that psychological well-being had a positive, significant impact on the safety behavior variable. As the pilots' psychological well-being increased, their safety behavior also increased. Psychological well-being indicated states that included goodness, harmony and good relationships with others, both between individuals and within groups [13]. Psychological well-being describes a condition in which individuals have a positive attitude toward themselves and others, make their own decisions, manage their own behavior, create and manage environments compatible with their needs, have purpose in life, make their lives more meaningful, and seek to explore and develop themselves. This suggests that a pilot with better psychological well-being tends to have a good output regarding both attitude and behavior or in keeping with safety factors [14]. These results were similar to those from a study by Davila and Finkelstein (2013), who posited a positive relation between organizational citizenship behavior and physiological well-being, where physiological well-being had an important role in determining behavior development. Furthermore, Couto et al. found that employees' high resilience was associated with high psychological well-being. Conversely, high stress was associated with low psychological well-being [15]. Finally, Clarke's study (2010) also showed that organizational and psychological factors could influence the employees' possible risky behavior at the level of workplace accidents [16].

This study had several limitations. First, it was conducted only to unravel the relationship of safety climate and psychological well-being with safety behavior; it did not examine the relation of each dimension of its variable. This study also did not explain the accident factor as a result of safety behavior. Second, the sample was obtained using the consecutive sampling technique; therefore, it did not reflect the overall population of the Aviation Medical Center in Jakarta. Finally, this study used a self-rating scale.

## 5. Conclusions

Both alone and together, safety climate and psychological well-being had a positive, significant impact on the civil pilots' safety behavior in Indonesia, but safety climate had a more dominant impact on safety behavior than psychological well-being.

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