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A Theoretical Model to Understand Flight Instructors' Safety Behaviors in the United States: Through Personality Traits, Self-Efficacy, Risk Perception, and Safety Climate

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Safety is an important aspect for any organization or individual to be successful, and the field of aviation has no exceptions. A CFI is authorized to give training and endorsements required for student, private, commercial, and instrument pilot certificates. CFIs play a very critical role in the success of pilot-in-training students at flight schools (Osman et al., 2022). According to AOPA (2015), the two greatest risks in flight training are loss of control inflight (LOC) and midair collisions. Moreover, approximately 71% of the accidents in which a CFI was involved happened during takeoff/climb, low-altitude maneuvers, and Instrumental Meteorological Conditions (IMC). The probable cause of LOC and midair collisions was due to poor decision-making, bad judgment, and unsafe behaviors of the CFIs (AOPA, 2015). In psychological aviation research, various perspectives, such as those associated with social cognition and personality, have attempted to explain individual differences in risky behaviors and accident involvement (Ji et al., 2011). The purpose of the present study was to build a theoretical model that demonstrates the relationship between personality traits, self-efficacy, risk-perception, safety climate, and safety behaviors of CFIs. A literature review was conducted to identify the existing relationships between the target constructs used in the study and the safety behaviors among workers across various aviation and non-aviation work settings. Over 100 abstracts were reviewed for relevancy, and 43 articles published between 1990 and 2020 were selected for full review. Of the 43 articles selected, only 30 articles were thoroughly reviewed and used to extract information. The results indicated the proposed theoretical model: (a) CFIs' personality traits as measured by CFIs levels of Extraversion, Neuroticism, Conscientiousness, Agreeableness, and Openness will directly influence their safety behaviors; (b) CFIs' self-

efficacy and risk-perception named as affective domain variables will have a direct influence on their safety behaviors; (c) CFIs' safety climate will directly influence their safety behaviors; (d) CFIs' self-efficacy and risk-perception will mediate the relationship between CFIs' personality traits and safety behaviors; and (e) Flight school's safety climate, will moderate the relationship between CFIs' personality traits and their safety behaviors.

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Introduction

Safety is an important aspect for any organization or individual to be successful, and the field of aviation has no exceptions. According to the FAA, a certificated flight instructor (CFI) is a person who holds a current license issued by the FAA and is authorized to train student pilots to fly an aircraft. The roles and responsibilities of CFIs are found under the Electronic Code of Federal Regulation (Code of Federal Regulations, 2025). A CFI is authorized to give training and endorsements required for student, private, commercial, and instrument pilot certificates. CFIs play a very critical role in the success of pilot-in-training students at flight schools (Osman et al., 2022). Although, in the past two decades various advancements have taken place in the world of aviation to improve safety, there were 13, 297 flight accidents and incidents in which a CFI was involved over a 10-year period (2009-2018), in the United States (National Transportation Safety Board [NTSB], 2018). Given that the accident and fatality rates of instructional flying are very high, there is often a question in the minds of the prospective flight students: How safe is the flight training? According to the 27th Nall Report (Airline Owners Pilot Association [AOPA], 2015), the two greatest risks in flight training are loss of control inflight (LOC) and midair collisions. Moreover, approximately 71% of the accidents in which a certificated flight instructor (CFI) was involved happened during takeoff/climb, low-altitude maneuvers, and Instrumental Meteorological Conditions (IMC). The probable cause of LOC and midair collisions was due to poor decision-making, bad judgment, and unsafe behaviors of the CFIs (AOPA, 2015).

In psychological aviation research, various perspectives, such as those associated with social cognition and personality, have attempted to explain individual differences in risky behaviors and accident involvement (Ji et al., 2011). Studies have examined how factors such as attitude, perceived risk, safety climate, and self-efficacy influence safety behaviors (Hunter, 2002, 2006; O' Hare, 1990). In the past, various theoretical models such as Big Five Personality (1990), Bandura's Self-efficacy (1977), and Bandura's Reciprocating Model (1987) have been studied to understand the safety behaviors of individuals. CFIs accompany pilots-in-training during their training process and play a very crucial role in developing their flying proficiency. Understanding the safety behaviors of CFIs could help the flight schools to improve their training program so that each student could be provided with optimal flight learning experiences and the safest environment possible. The purpose of the present study was to build a theoretical model that demonstrates the relationship between personality traits, self-efficacy, risk-perception, safety climate, and safety behaviors of Federal Aviation Administration (FAA) - approved CFIs. The theoretical model is grounded in the Big Five Personality theory and Bandura's self-efficacy theory.

Background

Historically, the effects of personality on the safety outcomes have been reported across various workplace settings (Barrick et al., 2013; Barrick & Mount, 1991; Christian et al., 2009). Some studies have also reported personality as a predominant factor in pilots' performance and training (King, 2014; Mesarosova et al., 2018). Studies related to personality research in aviation have emphasized understanding pilots' unsafe behaviors through personality traits (Musson et al., 2004; Siem & Murray, 1994). According to Barrick and Mount (1991), personality dimensions of Conscientiousness and Openness were positively related to job performance,

while Neuroticism, which is related to emotional (in)stability, was negatively related to performance in various jobs. Further, Siem and Murray (1994) found that personality traits were a significant indicator of pilots' training performance, with pilots high in Conscientiousness having higher training performance.

Researchers have also demonstrated that an individual's self-efficacy is a significant predictor of safety behaviors across various workplace settings (Adjekulm, 2017; Chen & Chen, 2012; Parasuraman et al., 1993; Parera et al., 2016; Prinzel, 2002; Graham & Weiner, 1995). Chen and Chen (2012) conducted a study to investigate the relationship between self-efficacy and airline pilots' safety behaviors. The findings suggested that as pilots perceived self-efficacy increased, their safety behaviors measured as safety participation and safety compliance also increased. In another study conducted by Li et al. (2018), it was found that pilots with higher self-efficacy are less likely to be involved in human errors and unsafe behaviors. In another study conducted by Adjekulm (2017), it was found that student pilots with a higher self-efficacy are more likely to project high levels of motivation, and eventually help them in being compliant to all the required safety behaviors put forth by the flight school. Past research has also shown significant relationships between the Big Five personality traits and an individual's self-efficacy (Djigic et al., 2014; Perera et al., 2016). In a study conducted by Perera et al. (2016), it was found that Extraversion, Conscientiousness, Agreeableness, and Openness were positively correlated to self-efficacy among teachers. In another study conducted by Djigic et al. (2014), it was found that individuals high in Conscientiousness and Openness were more likely to have a higher level of self-efficacy, whereas individuals high in Neuroticism had a lower level of self-efficacy.

According to Burns and Slovic (2012), risk is a part of everyday life that everyone takes while making a decision. Research in the fields of occupational health safety, workplace safety, and health psychology have found risk perception to have a significant effect on safety-related behaviors (Brewer et al., 2007; Christian et al., 2009; Kraut et al., 2011; Taylor & Snyder, 2017). Hunter (2006) found significant negative correlations between measures from the Risk Self-Perception Scale and previous hazardous events. Some studies have also found personality traits influencing risk perceptions, both in aviation and non-aviation contexts (Fyhri & Baker, 2012; Ji et al., 2018; Wang et al., 2016). Fyhri and Backer (2012) found that Neuroticism was negatively correlated with risk perception of an accident. Wang et al., (2016) found that, among the construction project managers (CPMs), Extraversion, Agreeableness, and Conscientiousness were related to risk propensity and risk perception. Wang et al. found that CPMs high in Extraversion, Agreeableness, and Conscientiousness had less propensity towards risk, and were more likely to perceive unsafe behaviors as high-risk behaviors. However, CPMs high in Neuroticism had high propensity towards risk and were more likely to perceive unsafe behaviors as low-risk behaviors.

According to Griffin and Neal (2000), a safety climate is an important antecedent of safety performance across various work settings (Griffin & Neal, 2000; Hofmann & Stetzer, 1996). Mearns and Flinn (1999) found that employees' risk perception, which influences safety behaviors, was influenced not only by the working conditions but also by the organizational safety climate. Studies in the past have also found that employees working in both aviation and non-aviation settings who perceived high levels of safety climate also projected positive safety

behaviors (He et al., 2020; Kouabenan et al., 2015; Lu & Tsai, 2010). Similarly, in a study conducted by Chen and Chen (2012), it was found that Safety Management System (SMS) practices were a critical determinant that influenced pilots' safety behavior. Among their findings, Chen and Chen concluded that SMS practices directly affected pilots' safety behavior. According to Fernandez-Muniz et al. (2007), the practice of SMS not only reflects the organization's commitment to safety but is recognized as a critical ingredient in employees' perceptions about the importance of safety in their company. There has been a great deal of research conducted in the past to investigate the effects of personality traits on safety behaviors across various work settings. However, there is a dearth of research that examines the relationship between the personality traits of CFIs and their safety behaviors. Similarly, most of the studies in the past have investigated the individual effects of self-efficacy, risk perception, and safety climate on safety behaviors. Limited research has been conducted that examines the mediating and moderating effects that affective domain variables such as risk perception and self-efficacy and safety climate have on the relationship between personality traits and safety behaviors. As a result, the current effort's key significance will be to fill the gap by building a theoretical model that describes the direct and indirect relationships between CFIs' personality traits, self-efficacy, risk perception, flight school's safety climate, and CFIs' safety behaviors.

Theoretical Grounding

From the literature review, it is evident that there are three types of variables that could influence CFIs' safety behaviors: the personality of the individual, the affective domain attributes of the individual, and the environment surrounding the individual. Consistent with this viewpoint, this effort proposes a theoretical model of the relationships between CFIs' personality, self-efficacy, level of risk perception, safety climate, and safety behaviors, which is grounded in two cognitive-based theories: the Big Five personality model (1990) and Bandura's (1977) self-efficacy theory. According to Novikova (1993), the Big Five personality traits are one of the contemporary versions of factor models of personality developed in trait theory. "The Big Five personality traits are the most basic dimensions in the structure of human personality that determine the features of human thinking, feeling, and behavior" (Novikova, 1993, p.1). These personality attributes impact behaviors in a range of different ways and have been shown to influence work behaviors and safety behaviors (Barrick & Mount, 1991; Barrick et al., 2013; Bues et al., 2018). The affective domain represents an individual's emotions, feelings, and attitudes towards learning and behaviors (Hoque, 2016). According to Bandura (1977), self-efficacy refers to a person's perceptions and attitudes about their ability to do something. Self-efficacy beliefs may have a larger impact on an individual's actions, emotions, behaviors, and motivations than their actual skill level (Bandura, 1994).

Big Five Personality

Continuous and systematic efforts have been made by various researchers to organize the taxonomy of personality traits (Cattell, 1946; Digman, 1990; McDougall, 1932). The five-factor model (FFM) of personality, developed by Goldberg (1981), is a hierarchical organization of personality traits in terms of five dimensions: Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to Experience. The FFM later became known as the Big Five personality model (McCrae & Costa, 1990) and has been used by numerous researchers as a

framework to explore the influence of personality in relation to job performance (e.g., Barrick et al., 2013; Barrick & Mount, 1991; Beus et al., 2018; Salgado, 1997). The emergence of the Big Five personality model has been widely accepted (Digman, 1990; Goldberg, 1991), and the nature of each trait is summarized in Table 1.1.

Table 1.1
Big Five Personality Traits and Descriptions

Dimensions	Description
Neuroticism	Intensity and frequency of experienced negative emotions, sensitivity to negative aspects of environment
Extraversion	Amount of energy directed outwards to the external environment and need for external stimulation
Openness	Receptivity to a range of external and internal sources of information and new input
Agreeableness	Role a person adopts in relationships on a continuum from compassion to antagonism; likelihood of person taking on board, accepting, and being influenced by perspectives or concerns of others
Conscientiousness	Strength of purpose and drive to goal accomplishment

Note. Adapted from Costa, T., & McCrae, R. (1992). Normal personality assessment in clinical practice: The NEO Personality Inventory. *Psychological Assessment*, *4*(1), 5.

According to the Big Five personality model (McCrae & Costa, 1990), the people who score high in Openness (also called Openness to Experience, Culture, or Intellect) are usually artistic, curious, imaginative, and original; and have broad interests, sensitivity to aesthetic experiences and fantasy, and a rich emotional life. In the context of the current theoretical model, high levels of Openness may influence CFI to explore new challenges while flying, potentially reducing their risk perception. Reduced risk perception can result in more unsafe behaviors. This relationship is supported by a study conducted by Barrick et al. (2013) reported that individuals with high levels of Openness to Experience desire to have a greater control over what they do and how they do it, and given this nature, individuals high in Openness were more likely to disregard safety rules as a means of establishing higher autonomy.

Individuals who have high scores in Conscientiousness strive to achieve high standards and are self-disciplined, orderly, deliberate, responsible, thorough, and dutiful. In the context of the current theoretical model, CFIs who score high in Conscientiousness may be responsible and compliant to all the safety goals and policies put forth by the flight school. Therefore, the CFIs may execute positive safety behaviors by participating in all the safety goals and being compliant with all the safety procedures within the flight school. This theorized relationship has been supported by studies that have found that Conscientious individuals who are responsible, dutiful, and have a drive towards accomplishment of work-related goals are more likely to have fewer unsafe behaviors in manufacturing (Wallace & Vodanovich, 2003) and professional driving (Siebokaite & Endriulaitiene, 2012) settings.

Individuals who score high in Extraversion are typically warm, talkative, assertive, active, energetic, cheerful, and high in positive affect; they generally like to be around others and prefer stimulating environments. In the context of the current theoretical model, CFIs with high levels of Extraversion may have the tendency to be optimistic and excitement-seeking. This nature of theirs may propel them towards risk-taking behaviors such as taking shortcuts and not using safety equipment, leading to unsafe behaviors. This relationship is supported by a study conducted by Gao et al. (2020) that found that construction workers high in extroversion are more energetic and are more likely to take risks, and this nature could propel them to be involved in unsafe behaviors.

Individuals who score high in Agreeableness are typically altruistic, cooperative, compassionate, appreciative, forgiving, generous, kind, and sympathetic, and they trust others' good intentions. In the context of the theoretical model, CFIs who score high in Agreeableness may be cooperative, generous, and kind towards the student pilots. This nature of the CFIs may help them stay calm during a risky situation while flying with the student pilots and following proper safety procedures. This hypothesized relationship is supported by Barrick et al. (2013), who reported that highly agreeable individuals are driven to behave in a way that fosters and preserves positive and meaningful relationships with others. As a result, individuals high in Agreeableness may be less likely to engage in unsafe behavior as doing so could damage interpersonal relationships with students or coworkers at the flight school.

Individuals who score high in Neuroticism are emotionally sensitive; they often become upset quickly and frequently experience negative emotions and include traits such as sadness, anger, anxiety, worry, self-consciousness, vulnerability to stress, and a tendency to act impulsively. In the context of the current theoretical model, CFIs who score high in Neuroticism may easily be upset with a small mistake by the student pilots while flying. This can lead to impulsive action, which can involve risky behavior, thus leading to unsafe behaviors. Siebokaite and Endriulaitiene (2012) found that individuals high in Neuroticism have the tendency to act impulsively while driving, and this nature led them to engage in more frequent unsafe driving behaviors relative to less neurotic individuals.

Self-Efficacy theory

Augmenting the Big Five personality model and its relationship to safety behaviors is Bandura's (1977) self-efficacy theory. According to Bandura (1981), self-efficacy refers to "judgments of how well one can execute courses of action required to deal with perspective situations" (p. 122). In other words, self-efficacy is how people believe or perceive their ability to carry out a desired action or achieve a goal. Self-efficacy is not related to a person's actual level of competency but instead is concerned with how a person perceives or judges his or her capabilities to perform certain actions (Bandura, 1982). Self-efficacy beliefs may have a larger impact on an individual's actions, emotions, and motivations than their actual skill level (Bandura, 1994). Individuals with high self-efficacy are more likely to engage in certain behaviors when they believe that they are capable of performing the behaviors successfully. In contrast, individuals with low self-efficacy are more likely not to engage in an activity if they believe they will not be successful (Bandura, 1982).

In the context of the current theoretical model, CFIs who are compliant with all the safety-related tasks put forth by the flight school are more likely to have high self-efficacy. These CFIs with high self-efficacy are more likely to have a high confidence in being compliant to all the safety protocols and objectives put forth by the flight school in the future. This nature could lead to more safety behaviors. With these theoretical groundings and the empirical support highlighted above, there is clear support for the development of such a theoretical model. The following sections detail the literature review and analysis methodology utilized to develop the proposed theoretical model and present the resulting model and associated implications.

Methods

A literature review was conducted to identify the existing relationships between the target constructs used in the study and the safety behaviors among workers across various aviation and non-aviation work settings. These relationships included: (a) Personality traits influencing safety behaviors, (b) Risk perception influencing safety behaviors and mediating the relationship between personality traits and safety behaviors, (e) Self-efficacy influencing safety behaviors and mediating the relationship between personality and safety behaviors, (f) Organizational safety climate influencing safety behaviors and moderating the relationship between personality and safety behaviors. Based on these relationships, a literature review was conducted to identify the relevant articles.

Literature was searched using the following databases: ProQuest, Google Scholar, and 4-year private universities' library databases. The following keywords were used: pilots, flight instructors, safety behaviors, personality traits, five-factor model (FFM), Big Five Personality traits, self-efficacy, risk-perception, and mediating and moderating relationships. Although this literature review focused primarily on the Big Five personality factors, the literature reviewed revealed research involving other personality traits, such as proactive personality and authentic leadership personality, which were included given their relevancy to the impact they had on risk-perception, self-efficacy, and safety behaviors. Over 100 abstracts were reviewed for relevancy, and 43 articles published between 1990 and 2020 were selected for full review. Of the 43 articles selected, only 30 articles were thoroughly reviewed and used to extract information pertaining to: (a) the direct effect of personality traits on safety behaviors, (b) the direct effects of self-efficacy and risk-perception on safety behaviors, (c) the mediating effects of self-efficacy and risk perception on the relationship between personality and safety behaviors, and (d) the moderating effects of safety climate on the relationship between personality and safety behaviors. These articles were from seven different domains: aviation, education, nuclear power plants (NPP), construction, driving, athletics, manufacturing, and the general population. The following information was extracted from the reviewed articles: purpose of the study, target population and sample, constructs measured, type of instruments used to collect data, and summary of findings. From each relevant article, any relationships identified between personality traits, self-efficacy, risk perception, safety climate, and safety behaviors were extracted. Based on the relationships identified from the paper review, a matrix was created with a mapping of positive, negative, or lack of relationships between the target constructs of personality traits, self-efficacy, risk perception, safety climate, and safety behaviors. The total frequency counts of studies that supported each relationship were calculated, and based on these frequency counts, a proposed

theoretical model was built that determined the direct and indirect relationship between personality traits, self-efficacy, risk perception, safety climate, and safety behaviors among CFIs.

Results

The literature review resulted in 30 articles that met the study's criteria and were analyzed to extract construct relationships. Table 1 summarizes the domains and sample sizes from the studies that were analyzed. A summary of the literature review is presented below and organized based on the relationships being examined, including: (a) Personality influence on safety behaviors, (b) Risk perception influence on safety behaviors and mediating the relationship between personality and safety behaviors, (c) Self-efficacy influence on safety behaviors and mediating the relationship between personality and safety behaviors, (d) Safety climate influence on safety behaviors, and (e) Safety climate moderating the relationship between personality and safety behaviors.

Table 1
Summary of Sample Size Based on Domain

Domain [a]	Sample Size	
	N[b]	% [c]
Aviation	1980	18.14%
Athletics	211	1.93%
Construction	1130	10.35%
NPP	462	4.23%
Students	302	2.77%
Education	1810	16.58%
Manufacturing	964	8.83%
Driving	324+329	2.97%
General Population	4036	36.97%
Total	10,917,	100%

Note: [a] indicates the domain from which the article was reviewed. [b] indicates the total number of sample sizes from all the articles that were reviewed from each domain. [c] indicates the proportion of the sample from each domain.

Personality Influence on Safety Behaviors

Historically, the significant effects of personality on safety outcomes have been reported across various workplace settings (Barrick et al., 2013; Barrick & Mount, 1991; Christian et al., 2009; Clarke & Robertson, 2008; Gao et al., 2020; Hogan & Foster, 2013). Some studies have also reported personality as a predominant factor in pilots' performance and training (Bartram, 1995; King, 2014; Mesarosova et al., 2018). In a study conducted by Jong-Hyun et al. (2018), significant effects of personality on safety behaviors were found when the effects of personality variables on employees' safety behavior were investigated at a South Korean nuclear and chemical power plant. A survey questionnaire consisting of items related to personality traits and

safety behaviors was distributed to a total of 300 workers in nuclear and chemical plants. A total of 243 questionnaires were collected, with a response rate of 81%. Out of the 242 respondents, 215 (88.8%) were men, and 27 (11.2%) were female. John-Hyun et al. reported that Openness to experience ($\beta = .133$, $p < .05$), Emotionality ($\beta = .142$, $p < .05$), which is an aspect of Neuroticism, and Honesty-Humility ($\beta = .127$, $p < .05$), which is an aspect of Conscientiousness, were found to be significantly and positively correlated with safety behaviors.

In another study conducted by Tao et al. (2020), Neuroticism was significantly related to human errors, while Conscientiousness was significantly related to safety participation among nuclear power plant (NPP) commission workers in China. This study's primary goal was to examine the roles of a set of demographics, personality, and attitudinal factors on self-reported safety behaviors (including safety participation and human errors). A total sample of $N = 157$ workers from the NPP participated in the survey. All the data was analyzed using Pearson's bivariate correlations to determine intercorrelations among personality traits and safety behaviors. The results demonstrated that Neuroticism ($r = .37$, $p < .01$) was significantly and positively related to human errors. A plausible explanation for this is that neurotic people are often impatient, anxious, and irritated (Barrick & Mount, 1991; Clarke & Robertson, 2005). Thus, they might be preoccupied with worry and anxiety, distracted from their tasks, and more likely to commit errors and be involved in accidents. Tao et al.. also reported that Conscientiousness was positively correlated with safety participation ($r = .48$, $p < .01$). A plausible explanation for this is that conscientious workers possess a high degree of self-discipline and are more willing to take on their responsibilities, such as compliantly adhering to rules for workplace safety.

Qu et al. (2022) conducted a study to investigate the effects of personality traits on the driving behaviors of professional truck drivers. The study used a sample of N = 389 male truck drivers in China. The truck drivers completed a short survey that included a Big Five inventory questionnaire and a driving behavior questionnaire. The driving behavior questionnaire included five subscales: positive driving behavior, aggressive violation, ordinary violation, errors, and lapses. For example, a driver scoring high in the positive driving scale and low in the aggressive violation, ordinary violation, errors, and lapses scale is considered to have safe driving behaviors. Pearson's correlation analysis was conducted to analyze the relationship between the Big Five personality traits and the driving behaviors of the truck drivers. The results indicated that Agreeableness ($r = 0.47$, $p < .001$), Conscientiousness ($r = 0.38$, $p < .001$), Openness ($r = 0.27$, $p < .001$), and Extraversion ($r = 0.17$, $p < .001$) were positively related to positive driving behavior scale. However, Neuroticism ($r = -0.38$, $p < .001$) was negatively related to the positive driving behavior scale. The results also indicated that Agreeableness ($r = -0.52$, $p < .001$), Conscientiousness ($r = -0.55$, $p < .001$), Openness ($r = -0.45$, $p < .001$), and Extraversion ($r = -0.38$, $p < .001$) were negatively related to aggressive violations of the driving behavior scale. Whereas Neuroticism ($r = 0.45$, $p < .001$) was positively related to aggressive violations of the driving behavior scale. The findings of this study indicated that there was a consistent relationship between the personality traits of truck drivers and their driving behaviors. Truck drivers high in Agreeableness, Conscientiousness, Openness, and Extraversion had lower errors, lapses, and violations, indicating positive safety behaviors. Whereas truck drivers high in Neuroticism had higher errors, lapses, and violations, indicating more unsafe behaviors.

Risk Perception Directly Influencing Safety Behaviors and Mediating the Relationship Between Personality Traits and Safety Behaviors.

Various research in the fields of occupational health safety, workplace safety, and health psychology have found risk perception to have a significant effect on safety-related behaviors (Brewer et al., 2007; Christian et al., 2009; Kraut et al., 2011; Taylor & Snyder, 2017). The relationship between risk perception and pilots' safety behavior has been found to be clearly strong (Ji et al., 2018; Taylor & Snyder, 2017). Taylor and Snyder (2017) conducted a laboratory study to investigate the impact of risk perception on safety behaviors. A total of 80 students were randomly divided into two groups and were asked to perform two seemingly dangerous tasks. The supervisor's commitment to safety was manipulated, and safety behavior was assessed using video data rated by an observer. The results suggested that risk perception, when framed regarding the risk of not performing the safety procedures, was positive ($r = .35$, $p < .01$) related to safety behavior, and as well as to supervisor commitment to safety ($r = .24$, $p < .05$).

Ji et al. (2018) conducted a study to investigate the mediating effect of risk perception on the relationship between proactive personality, which is related to Conscientiousness, and situational judgement among the flying cadets. Situational judgment was defined as the ability to make a low-risk decision during a state of emergency and is therefore related to safety behaviors. A total of $N = 257$ pilots from China's Southern Airlines took part in this study. All of the participants responded to a self-administered questionnaire survey that measured risk tolerance, risk perception, and safety operating behaviors. The data was analyzed using Structural Equation Modeling (SEM) analyses, and hierarchical regression analyses were applied to detect the effects of risk perception on safety operation behaviors among airline pilots. The study hypothesized that risk perception significantly mediates the relationship between flying cadets' proactive personality and situational judgement. The obtained results showed that a proactive personality has both a direct effect and an indirect effect mediated by risk perception on flying cadets' situational judgment. The results demonstrated that the relationship between proactive personality on situational judgment was mediated by risk perception, and this was significant at $p < .001$. Moreover, it was also reported that a proactive personality was positively related to risk perception, and risk perception was positively related to situational judgement among flying cadets. A plausible explanation can be that flying cadets with higher levels of proactive personality were more likely to perceive the risk of a specific flight environment and, consequently, were able to judge more effectively.

In another study, Machin and Sankey (2008) investigated the strength of the relationship between personality factors, risk perceptions, and driving behavior among young, mainly inexperienced drivers. A total of $N = 159$ participants completed the online survey with an age range of 17 to 52 years. The sample was randomly drawn from all the departments of the University of Southern Queensland (USQ) student population. All the data was collected through an online survey that included questions about personality, risk perception, and risky driving behaviors. Machin and Sankey reported Extraversion to be positively and significantly related with risk driving behaviors ($\beta = .18$, $t = 2.27$, $p < .05$), and Agreeableness ($\beta = -.23$, $t = -2.92$, $p < .01$) to be negatively and significantly related to risk driving behaviors. The findings also suggest that young drivers with higher levels of Extraversion and lower levels of Agreeableness reported greater speeding or risky driving behaviors. Abdelrahman (2020) conducted a study to

investigate how risk perception mediates the relationship between Big Five Factor personality dimensions and social distancing behaviors among the residents of Qatar. The results demonstrated that Conscientiousness ($r = .27$, $p < .001$) and Neuroticism ($r = .18$, $p < .001$) were positively correlated with social distancing. Additionally, risk perception ($r = .25$, $p < .001$) was also positively related to social distancing (Abdelrahman, 2020). A plausible explanation for this finding can be that individuals high in Conscientiousness are more responsible, and individuals high on Neuroticism are more fearful; these natures may influence them in perceiving higher risk and practicing social distancing.

Self-Efficacy Directly Influencing Safety Behaviors and Mediating the Relationship Between Personality Traits and Safety Behaviors.

Bandura's self-efficacy theory has been extensively studied in the fields of education, sports, military science, commerce, and so forth. Historically, various researchers in the past have demonstrated that an individual's self-efficacy is a significant predictor of safety behaviors across various workplace settings (Adjekulm, 2017; Chen & Chen, 2014; Parasuraman et al., 1993; Prinzel, 2002; Graham & Weiner, 1995). Individual self-efficacy has been observed as a predictor in several studies that investigate pilots' work-related behaviors (Parasuraman et al., 1993; Prinzel, 2002). Moreover, self-efficacy was also found to mediate the relationship between personality and safety behaviors across various domains (Li et al., 2017; Zhang et al., 2020).

Chen and Chen (2014) conducted a study to investigate the effects of self-efficacy on commercial airline pilots' safety behaviors. A total of $N = 239$ commercial pilots from five different Taiwanese airlines participated in the study. A total of 420 survey questionnaires that included the general self-efficacy scale and Neal and Griffin's (2006) safety behaviors scale were either deposited in the pilot's individual mailbox or distributed onboard an aircraft with sealable stamped and addressed envelopes. Chen and Chen used SEM techniques to analyze the data. The results demonstrated self-efficacy has significant ($p < .05$) and direct, positive effects on pilots' safety behaviors. The findings suggested that as the pilots' perceived self-efficacy increased, the safety behaviors measured as safety participation and safety compliance also increased. A plausible explanation could be that individuals with high levels of self-efficacy have greater confidence in their own abilities to achieve specific goals. Therefore, pilots with higher perceived self-efficacy are likely to better resist pressure and devote more effort to improve their safety-related behaviors.

Similar results were found in a study conducted by Li et al. (2018). The primary aim of Li et al.. was to explore the relationship between self-efficacy, work engagement, flight experience, and human error and safety behaviors among pilots during in-flight missions. A total of $N = 143$ airline pilots took part in the study. All the pilots participating in the study completed three questionnaires: the Perceived Professional Self-Efficacy Scale (PPSEC), the Utrecht Work Engagement Scale (UWES), and the Safety Operation Behavior Scale (SOBS). The data was analyzed using correlation analysis. The results indicated that self-efficacy, work engagement, and human error and safety behaviors were significantly correlated with each other. Li et al. also reported that through causal steps regression and bootstrap analysis, the airline pilots' self-efficacy significantly influenced their human error and safety behaviors. Self-efficacy accounted for about 22.3% variance in human errors, and this was significant at $p < .001$(Li et al., 2018).

The findings also suggest that pilots with higher self-efficacy are less likely to be involved in human errors and unsafe behaviors. The results of this study were also consistent with the previous investigation that investigated self-efficacy as a predictor of job performance (Alessandri et al., 2015; Tims et al., 2014).

Similar results were found in another study conducted by Adjekulm (2017), who investigated the effects of self-efficacy on safety participation and safety compliance in a collegiate aviation program of a publicly owned university in the United States. The study used a total of $N = 800$ students enrolled in flight-related courses at the university. A total of $N = 282$ responses were completed beyond the consent page and used for analysis. Out of the 282 respondents, 247(87.6%) were male, and 35 (12.4%) were female. All the participants responded to a 46-item questionnaire that included items related to the constructs of self-efficacy, safety participation, and safety compliance. The results of Adjekulm 's study demonstrated that self-efficacy has a strong direct effect on safety compliance. This finding was also in support of Chen and Chen's (2014) result that indicated self-efficacy as a significant predictor of safety-related behaviors. A plausible explanation for this finding is that student pilots with higher self-efficacy may project high levels of motivation, and this confidence of theirs may help them in being compliant to all the required safety behaviors put forth by the flight school.

A study was conducted by Zhang et al. (2020) to identify the factors that contribute to mobile phone use while driving (MPUWD) for food delivery. The study used a total sample of $N = 315$ food deliverymen, and the sample was collected through the snowball sampling strategy. All the participants in the study completed a self-reported questionnaire that included items related to demographics, personality traits, risk perception, driving self-efficacy, and mobile phone use while driving. Results from SEM analysis and bootstrapping techniques indicated that self-efficacy partially mediated the relationship between personality traits of (a) Psychoticism, which embodies traits such as impulsivity and lack of sympathy, and (b) Extraversion and MPUWD behaviors. The findings indicated self-efficacy mediated the effect of personality traits such as Psychoticism ($r = .18$, $p < .01$) and Extraversion ($r = .12$, $p < .05$) on MPUWD behaviors. However, self-efficacy fully mediated the relationship between these personality traits and risk perception ($r = .54$, $p < .001$). The SEM estimates and bootstrap estimates suggest that although the personality traits of the deliverymen had a direct influence on their MPUWD behaviors, self-efficacy was found to be an antecedent factor before the MPUWD behavior. A plausible explanation is that the food delivery driver's motivation to deliver the food in a timely manner may engage them in using the mobile more frequently while driving.

In a study conducted by Li et al. (2017), it was found that the impact of proactive personality, related to Conscientiousness, on teachers' innovative work behavior was mediated by creative self-efficacy. A total of $N = 352$ valid questionnaires were returned, with a response rate of over 95%. All the participants responded to a self-administered questionnaire related to proactive personality, innovative work behaviors, and creative self-efficacy. The results demonstrated that proactive personality ($r = .31$, $p < .01$) positively correlated with creative self-efficacy, and self-efficacy ($r = .28$, $p < .001$) was significantly correlated with teachers' innovative work behaviors (Li et al., 2017). Based on the above results, Li et al. also suggested that creative self-efficacy fully mediates the relationship between proactive personality and innovative work behaviors among teachers. A plausible explanation for this may be that the

proactive nature of the teacher may give them the advantages of being dutiful and responsible, increasing cognitive flexibility, and this helps them in achieving higher levels of creative self-efficacy, thus helping them implement innovative processes.

Safety Climate Influence on Safety Behaviors

Various studies in the past have confirmed the relationship between safety climate and safety behaviors (He et al., 2020; Kouabenan et al., 2015; Lu & Tsai, 2010). Lu and Tsai (2010) conducted a study to investigate the effects of a safety climate on the safety behaviors among seafarers working on a container ship. The safety climate was measured by understanding the seafarers' perception of their company's safety policy and safety management. The study investigated two hypotheses: (a) Safety policy will be positively related to seafarers' safety behavior in container shipping, and (b) Safety management will be positively related to seafarers' safety behavior in container shipping. A total of 773 seafarers from 13 countries working in 124 different vessels participated in the study. All the participants in the study responded to a 26-item questionnaire that included items related to safety, climate, and safety behaviors. As there were participants from China (133) and Taiwan (208), a Chinese version of the questionnaire was also prepared. The data was analyzed using a Chi-square test. The results indicated that overall model fit was significant χ^2 (183) = 687.84, $p < .00$, safety policy had a significant and positive effect on seafarers' safety behaviors ($\beta = 0.29$, $p < .05$). However, safety management was positively related to safety behavior but not significant ($\beta = 0.78$, $p > .05$). The findings of the study indicate that higher management safety policies, goals, and priorities influence the safety behaviors of seafarers. The findings also indicate that when seafarers perceive that a strong emphasis is given by their organization on safety policy and safety management, they are more likely to have positive safety behaviors.

In a study conducted by Kouabenan et al. (2015), it was found that there was a positive relationship between safety climate and involvement in safety management among the First Line Managers (FLMs) working at nuclear plants in France. Safety management was defined as "the extent to which FLMs undertake the preventive actions from involving in a high-risk situation" (Kouabenan et al., p. 5, 2015). In the context of the proposed study, safety management is related to safety behaviors. For example, an FLM who has a high involvement in safety management is less likely to be involved in unsafe behaviors and, therefore, displays positive safety behaviors. The study used a sample of 63 FLMs from two different nuclear plants. The sample included FLM's maintenance (54.1%), production (21.3%), logistics (8.2%), risk prevention (8.2%), and services (8.2%). All the data was collected in a questionnaire that included items related to safety climate, perceived risk, and safety management. The data were analyzed using SPSS 20.0 software. The results indicated that there was a positive and significant relationship between safety climate and involvement in safety management ($r = .757$, $p < .01$). The findings suggested that FLMs who perceived to have a high safety climate were more likely to have a high involvement in safety management.

In another study conducted by He et al. (2020), it was found that there was a positive association between safety climate and safety behaviors among workers and supervisors working at construction organizations in China. The study investigated two hypotheses related to the association of safety climate and safety behaviors: (a) Safety climate is positively related to

safety compliance of construction workers and supervisors, and (b) Safety climate is positively related to safety participation of construction workers and supervisors. The results indicated that the safety climate was both significant and positively related to safety compliance ($r = .52$, $p < .01$) and safety participation *(*$r = .58$, $p < .01$) among construction workers and supervisors. The findings of the study also align with previous studies (Kouabenan et al., 2015; Lu & Tsai, 2010) that indicated that employees who perceive a high safety climate are more likely to have positive safety behaviors.

Safety Climate as a Moderating Variable

In this section, a presentation of the studies that investigated the moderating effects of safety climate on the relationship between personality and safety behaviors is given. Rajabi et al. (2020) conducted a cross-sectional study to examine the moderating effects of safety climate on the relationship between personality traits and safety performance. A total sample of $N = 487$ operational staff working at a gas refinery in Iran participated in the study. One of the hypotheses of Rajabi et al. 's study was that a safety climate has a moderating effect on the relationship between Impulsiveness, which is a personality trait that is closely related to Neuroticism (Garcia-Argibay, 2019), and safety performance. The results of the study indicated that Impulsiveness had indirect negative correlations with safety compliance ($r = -.28$, $p < .01$) and safety participation ($r = -.22$, $p < .01$; $\beta = -0.075$; Rajabi et al., 2020). Results also showed that safety climate had a direct positive correlation with safety compliance ($r = -.35$, $p < .01$) and safety participation ($r = -.36$, $p < .01$). The results of the study also indicated that a significant relationship between Impulsiveness, safety compliance, and safety participation was being moderated by safety climate ($R^2 = 0.20$, $p < .001$). The findings suggested that a higher safety climate weakens the direct effects of Impulsiveness traits on safety compliance and safety participation among operational workers at gas refineries in Iran. As the Impulsiveness personality trait is closely related to Neuroticism (Garcia-Argibay, 2019), when applied to the context of the FFM, a higher safety climate is proposed to weaken the negative and direct effects of Neuroticism on safety behaviors.

Doerr (2020) conducted a study to examine when and how safety climate moderated the relationship between personality traits and workplace safety behaviors. A total of N = 492 participants took part in the study. All the participants were full-time employees working in various organizations in the United States. All the participants responded to a Qualtrics survey that included items related to their current job roles, personalities, perceptions of safety climate, and self-reported ratings of their own safety behaviors. Results indicated that safety climate moderates the relationship between personality traits of Conscientiousness and Extraversion and safety behaviors. It was also found that the moderation effect of the safety climate on the relationship between Conscientiousness and safety behaviors was significant at $p < .001$ (Doerr, 2020). This finding suggests that when employees' perception of safety climate was high, the relationship between Extraversion and safety behaviors was moderated by safety climate. These finding suggests that "personality traits are related to safety behaviors and an organization's safety climate could encourage or discourage the employees from being compliant to the safety procedures in the organization" (Doerr, 2020, p. 280).

Lee and Dalal (2016) conducted a study to investigate whether safety climate moderates the relationship between Conscientiousness and safety compliance among employees working at

manufacturing organizations in South Korea. The study used a sample of 964 participants. Conscientiousness was measured by an 8-item Conscientiousness subscale from Saucier (1994). The safety climate was measured by using the Safety Climate scale developed by Griffin and Neal (2000). Safety compliance was measured with Neal and Griffin's (2006) scale. The study used a hierarchical linear modeling strategy to analyze the data. The results of the study indicated that the interaction between Conscientiousness and safety climate was statistically significant for safety compliance ($r = – .65$, $p < .01$). Specifically, the findings indicated that higher safety climate weakens the positive and direct effects of Conscientiousness on safety behaviors The findings of the study also suggested that the relationship between Conscientiousness and safety compliance was stronger in weaker safety climates than in strong ones.

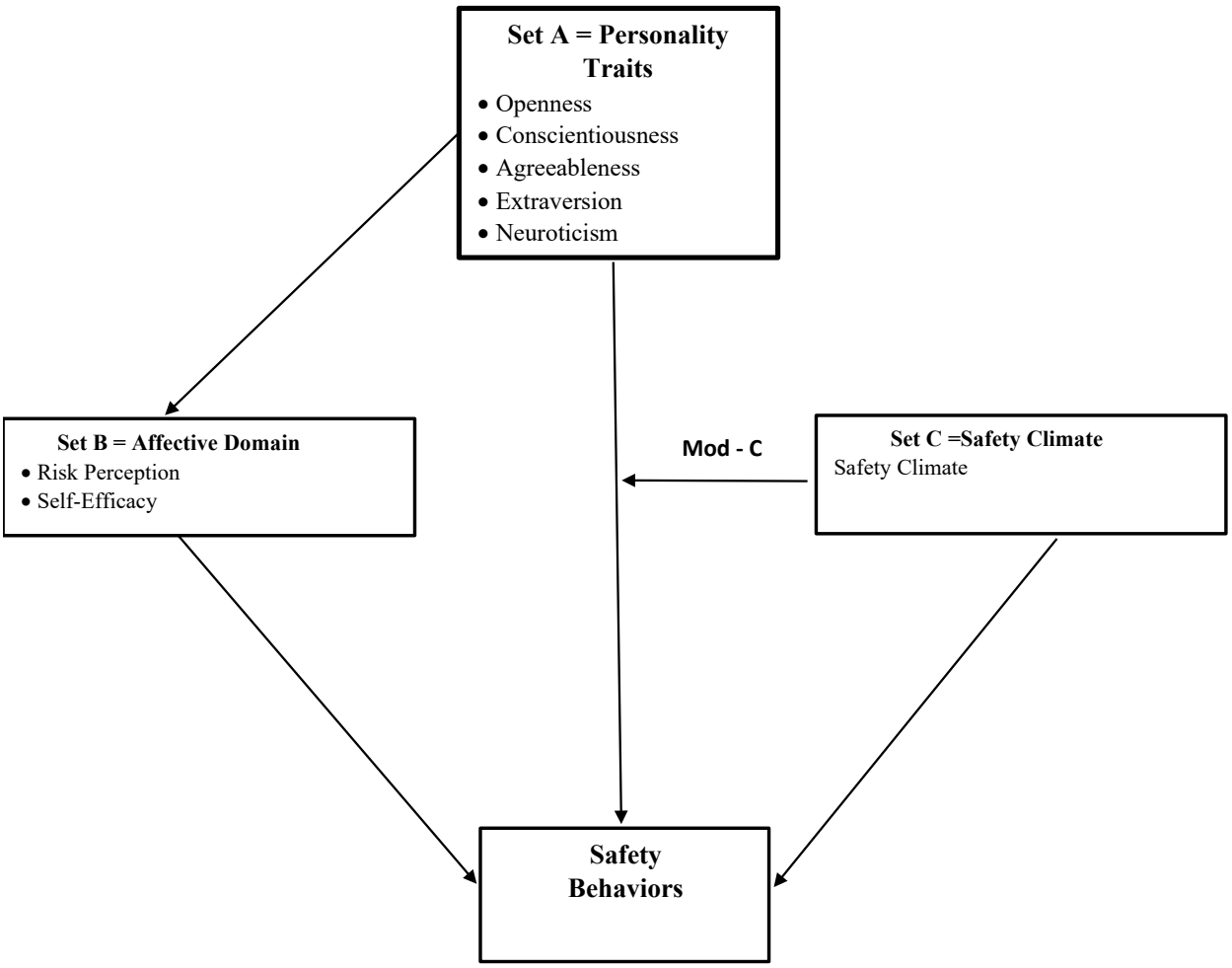
In a study conducted by Ji et al. (2019), it was found that safety climate moderated the relationship between personality and safety behaviors. A total of $N = 547$ flight attendants working for China Southern Airlines Limited took part in the study. A hierarchical regression analysis was conducted to test the moderating effect of safety climate on the relationship between proactive personality, which has been shown to be related to Extraversion, Agreeableness, and Conscientiousness (Bateman & Crant, 1993; Funder, 2001) and safety behaviors in flight attendants. The results demonstrated proactive personality and safety climate to be significantly correlated with safety behaviors ($r = .32$, $p < .01$; $r = .78$, $p < .01$). Furthermore, a significant positive interaction between proactive personality and safety climate was also found ($r = .25$, $p < .01$). Specifically, the findings indicated that higher safety climate weakens the positive and direct effects of proactive personality on safety behaviors and this interaction was significant at $p < .05$ (Ji et al., 2019). Whereas in organizations with a lower safety climate, the relationship between proactive personality and safety behaviors is stronger. A plausible explanation for this finding is that flight attendants working in an organization with a high safety climate are more likely to display positive safety behaviors regardless of their proactive personality traits. Whereas flight attendants working in an organization with a low safety climate, their proactive personality traits are more likely to influence their safety behaviors.

Similar to Ji et al. (2019), Baba et al. (2019) investigated the moderating effects of service climate on the relationship between proactive personality and service performance. The study used a self-administered questionnaire to collect data from a sample of $N = 485$ flight attendants, pilots, engineers, and service employees working at Chinese airlines. The questionnaire included items from the proactive personality scale, safety climate scale, and job performance scale. The data was analyzed using hierarchical regression analysis. The findings also suggested that the positive relationship between proactive personality and performance was observed only when the safety climate was perceived as high but not when it was perceived as low. Unlike the previous studies (Ji et al., 2019; Lee & Dalal, 2016), these findings were opposite in direction and suggested that the positive influence of proactive personality on performance is nullified where the safety climate is perceived to be low. A plausible explanation could be that individuals high in proactive personality are more likely to have positive safety behaviors; however, working in an organization with a low safety climate may lower their commitment towards safety, leading to unsafe behaviors.

Proposed Theoretical Model

Based on the findings from the reviewed literature, the following theoretical model is proposed in Figure 1. For the context of the current study, the research variables have been divided into three functional sets. Set A = Personality traits consist of five facets of personality traits, including Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. Set B, = Affective domain, was defined as "a learner's emotions toward the learning experience. It includes feelings, values, enthusiasm, motivation, and attitudes" (FAA, 2008, pp. 2–14). In the context of the current study, an affective domain consists of self-efficacy and risk perception. Set C = Safety Climate consists of safety climate.

Figure 1
Proposed Theoretical Model



Note. Mod – C indicates the moderating effect of the safety climate on the relationship between personality traits and safety behaviors.

The theoretical model proposes that: (a) CFIs' personality traits as measured by CFIs levels of Extraversion, Neuroticism, Conscientiousness, Agreeableness, and Openness will directly influence their safety behaviors; (b) CFIs' self-efficacy and risk-perception named as affective domain variables will have a direct influence on their safety behaviors; (c) CFIs' safety climate will directly influence their safety behaviors; (d) CFIs' self-efficacy and risk-perception will mediate the relationship between CFIs' personality traits and safety behaviors; and (e) Flight school's safety climate, as measured by CFIs' perceived management commitment to safety, safety training, and equipment and maintenance, will moderate the relationship between CFIs' personality traits and their safety behaviors.

Discussion

The studies reviewed in this paper demonstrated the extent to which personality traits, self-efficacy, risk-perception, and safety climate impact safety behaviors across various domains.

The results of these studies, in conjunction with Big Five personality model (1990) theory and Bandura's self-efficacy (1977) theory, provide support for the proposed theoretical model. When examining the effect of Big Five Personality traits on the safety behaviors of CFIs, the model proposes that Extraversion, Conscientiousness, Openness, and Agreeableness are more likely to have a positive relationship with CFIs' safety behaviors. However, Neuroticism will tend to have a negative relationship with CFIs' safety behaviors. When examining the relationship between risk perception, self-efficacy, and safety behaviors of CFIs, our model proposes that both risk perception and self-efficacy will have a positive relationship with CFIs' safety behaviors. In addition to the direct relationship, our model also proposes the indirect effects of self-efficacy and risk perception on the relationship between CFIs' personality traits and safety behaviors.

The model proposes that CFIs' self-efficacy will mediate the relationship between CFIs' personality traits of Neuroticism, Extraversion, Conscientiousness, and safety behaviors, and CFIs' risk perception will mediate the relationship between CFIs' personality traits of Conscientiousness, Neuroticism, and safety behaviors. When examining the relationship between safety climate and safety behaviors, the model proposes that flight schools' safety climate will tend to have a positive relationship with CFIs' safety behaviors. Moreover, our model also proposes that CFIs' flight school's safety climate will moderate the relationship between CFIs' personality traits and safety behaviors.

The practical implications of the proposed theoretical model are that it may provide insight to flight training organizations and CFIs in developing a clear understanding of how CFIs' personality could influence propensity towards risk-taking behaviors. These findings also provide flight schools insight with respect to the linkage between CFIs' personality types, risk perception, self-efficacy, and their safety behaviors. This could help the flight schools in building new safety procedures or protocols to accommodate CFIs of all personality types and enhance safety performance. Flight schools need to understand the impact a safety climate has as it can mitigate some of the negative effects of personality. The findings may also help the flight schools in understanding the impact of personality on safety behaviors as there is a potential to consider this in their hiring practices as well as training. Perhaps training can be adapted based on personality traits. The findings of the proposed study may also help flight schools in understanding the role of the safety climate in CFIs' safety behaviors. This could help the flight schools in building new safety goals, in which every CFI is motivated to contribute, to the best of their abilities, towards safety goals.

A caution to the reader is provided here that the results must be interpreted given the potential for limitations in generalizability due to the studies being from different domains and cultures, which may result in different relationships. The recommendation for future research will be to test the theoretical model by collecting empirical data from CFIs across the United States. By conducting an empirical study in the future, the theoretical model can be validated. If obtained results in the future align with the proposed model, it will provide support for the indirect effects of affective domain variables such as risk perception and self-efficacy on the relationship between the personality traits and safety behaviors along with the direct relationships among the constructs. Moreover, the empirical findings in future research can also inform the aviation community about the role of the safety climate in the relationship between the personality traits and safety behaviors of the CFIs.

Conclusions

There has been a great deal of research conducted in the past to investigate the effects of personality traits on safety behaviors across various work settings. However, there is a dearth of research that examined the relationship between the personality traits of CFIs and their safety behaviors. Similarly, most of the studies in the past have investigated the individual effects of affective domain variables and safety climate on safety behaviors. Limited research was conducted that examined the mediating and moderating effects of affective domain variables and safety climate on the relationship between personality traits and safety behaviors. A literature review was thoroughly conducted to examining the information related to: (a) the direct effect of personality traits on safety behaviors, (b) the direct effects of self-efficacy and risk-perception on safety behaviors, (c) the mediating and moderating effects of self-efficacy and risk perception on the relationship between personality and safety behaviors, and (d) the moderating effects of safety climate on the relationship between personality and safety behaviors. These articles were from seven different domains: aviation, education, nuclear power plants (NPP), construction, driving, athletics, manufacturing, and the general population. The results indicated the proposed theoretical model: (a) CFIs' personality traits as measured by CFIs levels of Extraversion, Neuroticism, Conscientiousness, Agreeableness, and Openness will directly influence their safety behaviors; (b) CFIs' self-efficacy and risk-perception named as affective domain variables will have a direct influence on their safety behaviors; (c) CFIs' safety climate will directly influence their safety behaviors; (d) CFIs' self-efficacy and risk-perception will mediate the relationship between CFIs' personality traits and safety behaviors; and (e) Flight schools' safety climatewill moderate the relationship between CFIs' personality traits and their safety behaviors.

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