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GENDER RELATED PERCEPTIONS, STRESS, ANXIETY, DEPRESSION, AND PERSONALITY CHARACTERISTICS: FEMALES ON THE FLIGHT DECK

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Abstract

This study explored gender related perceptions among male and female pilots and the extent to which such perceptions may cause workplace stress, anxiety, or depression which may affect female pilots. This study utilized two measuring instruments on a sample that consisted of 83 pilots and a third instrument on a sample of 52 female pilots and non-pilots. The three measurement instruments used where the Aviation Gender Attitude Questionnaire (AGAQ) to measure gender bias and the Depression Anxiety Stress Scales-21 (DASS-21) to measure stress among female pilots and the Armstrong Laboratories Aviation Personality Survey (ALAPS) to measure personality dimensions of female pilots. There was a significant difference found between males and females across all factors. While this study concurred with research that suggests that female pilots are at greater risk for negative perceptions and sexism by male pilots, this study did not indicate any greater degrees of depression, stress, or anxiety in females as compared to their male counterparts. However, this study found that female pilots were more like their male counterparts than females as a whole, thus allowing females to fit easer into the more male dominated workplace.

1 Introduction

Gender perceptions are attitudes held by a society that influence how males and females growing up in that society are inculcated into the gender system [30]. These attitudes are a function of the history, culture, daily interactions, and social norms of the society and heavily influence gender stereotypes and roles, beliefs about strengths and weaknesses of the genders, occupational choices open to the genders, choice of college majors, etc. [30]. Within these gender perceptions, there are few occupations considered to be gender-neutral [15]. The masculinization or feminization of an occupation often defines who enters the occupation, thus producing at some level a collusion by the genders on the continuation of gender-specific perceptions of particular occupations [1].

Entry by females into male gender-specific occupations often results in sexism, high scrutiny, isolation and ostracism, less favorable advancement opportunities, harassment to include sexual harassment, gender-role stereotypes, work-home conflicts, higher occupational dropout rates, and the need to adapt by assuming gender-incongruent behaviors [10, 16, 19, 22, 45]. Consistent with role strain theory, these are all attitudes which, if held in the workplace, are negative in nature and can produce stress, strain, and anxiety for the targeted individuals [10, 16, 22]. This is especially true for females who are often devalued any way [19]. The sequelae to workplace stress may include psychological and physiological reactions such as, but not necessarily limited to, emotional distress such as anxiety and depression, frequent headaches, muscle tension, change in sleep pattern or change in appetite, digestive problems, hormonal changes, muscular system changes, increase in heart rate, and changes in the immune and metabolic systems [39]. These

manifestations may be more evident in females when the work environment is seen as hostile or as a threat [45], particularly where interpersonal conflict, the primary sources of occupational stress, may be high [32].

Research has consistently shown that females in such gender-incongruent roles are significantly more stressed than their male counterparts, experience greater degrees of health problems, report lower levels of self-efficacy, self-esteem, and self-worth, experience a devaluing of their contributions, hold lowered expectations of success, and perceive lower support and commitment from the organization in comparison to their male counterparts [19, 20, 23]. By contrast, males working in female-specific occupations may not experience the same negative effects and associated stress since they are seen as being in that setting by choice, rather than forced by gender, and because males may advance faster in gender-incongruent occupations than females because males may be perceived as being better leaders [23].

Aviation, in particular, is one of those non-gender-neutral occupations. It has been historically considered to be a fixed (specific to one gender, only [3]) masculine occupation [19, 28]. Such gender-specific occupations produce their own unique cultures and dispositions to include gendered cultures and gendered dispositions [16, 22]. Indeed, women experience a *rite of passage* not experienced by men as they transition into the gendered culture of the airline pilot industry [14]. The continuation of the gendered culture of masculine beliefs, values, and gender biases [33] of the air pilot industry has resulted in sexism, high visibility and scrutiny, isolation and ostracism, less favorable advancement opportunities, and harassment of female pilots [14, 28, 33], leading many female pilots to quit the airline industry [19]. Additionally, some research (e.g., [17]) has indicated that the stereotypic negative gender perceptions toward female pilots even extends to passengers on commercial flights. Again, such negative attitudes can lead to stress, anxiety, health issues, etc. [14, 19, 28, 33].

Some might argue that affirmative action policies, instituted to level the playing field in many settings, to include employment, would offset the negatives which tend to accrue to women in a gender-incongruent occupation such as being a pilot. However, Muchinsky [34] and Germain et al. [19] have suggested that female pilots have been damaged by affirmative action policies in that it may appear that female pilots have been hired due to affirmative action rather than skill or ability. Additionally, female pilots-in-training may feel they are in training simply because of their gender, thus getting a break through affirmative action, rather than being trained based on perceived ability [28]. So even affirmative action may work against female pilots, thus adding to the negatives of the work environment. Davey and Davidson's [14] research suggested that female pilots, in order to make it within the masculine gendered culture of the industry, often adapt gender-incongruent behaviors to include laughing at sexist jokes, drinking with the males pilots, and otherwise becoming *one of the boys*. Adapting gender-incongruent behaviors, however, has a price in terms of increased stress in that these behaviors are seen as being less attractive in females [18, 19]. In an almost counter-intuitive way, attitudes by pilot instructors toward female students seems to be enhanced when the female portrays the typical role expected of females regarding dress, behavior, deference, etc. [13] and diminished if the female pilot-in-training shows a high level of competence [19].

Given these stereotypic beliefs, research has not supported, generally, any real differences in abilities between male and female pilots. For example, an examination of intelligence as measured by the adult Wechsler scale among United States Air Force pilots did not find any significant differences by gender [27]. Studies looking at aircraft accidents have not found differences in accident rates by gender [7, 33, 41], though there may be gender differences in the type of accident. Jonas [24], reporting on a study conducted by Johns Hopkins Bloomberg School of Public Health and reported in the May 2001 issue of *Aviation, Space, and Environmental Medicine,* stated that

the authors had examined accident rates of male and female private pilots and found that males were more likely to have accidents related to inattention or poor planning (e.g., ignoring weather conditions, taking unnecessary risks) while female pilots were more likely to have accidents due to mishandling the aircraft (e.g., panic maneuvers, ignoring the kinetics of the aircraft). The rates of pilot error reported were 95% for males and 88% for females [24].

Just as there are no definitive differences in the genders in intelligence or abilities, there does not appear to be personality differences based on earlier studies. For example, a study conducted by Novello and Youssef [36] examined 87 female pilots using the Edwards Personality Preference Schedule. Results indicated that female pilot profiles more closely resembled the profile of males, in general, and male pilots, in particular. In other words, there was greater within group variation than between group variation (see also [35]). Whether or not these findings are still valid, given the comparatively large influx of females into the piloting profession since 1974, remains unclear [2]. Apart from potential gender differences (or similarities), there is consistent evidence that pilots are generally less neurotic than the general population and higher on positive personality characteristics such as extroversion, interpersonal orientation, assertiveness, decision making, team cooperation, and emotional stability [2, 5, 25].

The purpose of this research was to determine if, and to what extent, gender related perceptions exist within the European and American pilot community. If negative gender related perceptions were found, then to what extent did these perceptions affect the stress, anxiety, and depression levels of female pilots? If differences were not found, could the absence of greater stress, anxiety, and depression by female pilots, as well as the apparently greater degree of tolerance, in comparison to male pilots, be a function of female pilot personality characteristics?

The study utilized three measurement instruments, the Aviation Gender Attitude Questionnaire (AGAQ, [43]) to measure gender bias, the Depression Anxiety Stress Scales-21 (DASS-21, [31]) to measure stress among female pilots, and the Armstrong Laboratories Aviation Personality Survey (ALAPS, [38]) to measure personality dimensions.

2 Methods

2.1 Participants

Information about participants was collected from a survey located on Survey Monkey, a popular survey site used to collect data for a number of different studies and purposes. The initial sample consisted of 83 pilots with 31 females and 52 males. The participants ranged in age from 21 to 72 (M=43.80, SD=13.04). Twenty-eight participants held Private Pilot's Licenses (PPL) with 55 holding an additional license (Commercial Pilot's License or Airline Transport License). Thirty-eight of the participants also held instructor's licenses. Thirty-one (37.34%) of the participants either had been, or currently were, in the military.

The average number of years of flying experience was 19.56 (SD=11.98, range from 1 to 46 years). The median number of hours of flying time was 3250 with a range from 70 hours to 22,198 hours.

Participants were primarily Caucasian (89.30%) with the remainder spread across African American, Hispanic, or Other. Additionally, 71 (84.50%) were from the United States with the rest from Europe. As a group, 74 participants held a college degree (associate's degree to graduate degree). Two just had a high school diploma and an additional seven had a high school diploma plus some college.

An additional 52 additional participants, consisting of 28 female non-pilots and 24 female pilots, were asked to respond to the

Armstrong Laboratory Aviation Personality Survey (ALAPS, [38]). The ALAPS examines 15 factored personality dimensions which are related to the *Big Five* (openness, conscientiousness, extraversion, agreeableness, neuroticism). The 15 dimensions are as follows: Confidence, Socialness, Aggressiveness, Orderliness, Negativity, Affective Lability, Anxiety, Depression, Alcohol Abuse, Dogmatism, Deference, Team Orientation, Organization, Impulsivity, and Risk Taking.

2.2 Instrumentation

For this study, three instruments were used. The first was the Aviation Gender Attitude Questionnaire (AGAQ) which was developed as an instrument to assess gender biases among pilots, specifically biases against female pilots [43]. The instrument originally consisted of 72 items but was reduced to 43 items through confirmatory factor analysis on pilots in Australia and South Africa [43]. The AGAQ is composed of 4 factors as follows: Flying Proficiency, Safety Orientation, Flight Confidence, and Erosion of Flight Standards. Cronbach alphas ranged from .81 to .92 [43]. Subsequent research has indicated that the AGAQ does not have any cultural bias that would limit use with pilots from different cultures [44].

The second instrument was the Depression Anxiety Stress Scale-21 (DASS-21, [31]). The DASS-21 was derived from the DASS 42-item scale. The DASS 42-item scale purports to measure depression, anxiety, and stress. Aspects of depression assessed include lack of interest, anhedonia, inertia, hopelessness, self-deprecation, and loss of interest in life. The anxiety subscale taps into autonomic arousal, situational anxiety, and subjective perceptions of affect associated with anxiety. The stress subscale assesses chronic non-specific stress or generalized stress--feelings of impatience, nervous arousal, irritability, and agitation. The DASS 42-item scale has shown appropriate discriminant and convergent validity with other scales, yielding a correlation of .81 between the DASS 42-item anxiety subscale and the Beck Anxiety Inventory and .74 between the DASS 42-item depression subscale and the Beck Depression Inventory [4, 31] and appropriate convergence with the Hospital Anxiety and Depression Scale and the Personal Disturbance Scale [21].

A 21-item research counterpart to the 42-item DASS was later developed (DASS-21) by Lovibond and Lovibond [31]. Comparison of the 42 and 21 item versions indicated the same factor structure and subscales with commensurate discriminant and convergent validity [8, 21]. Additional research by Henry and Crawford [21] suggested a negative affect dimension to both the depression and stress scale. The DASS-21 has shown consistent high levels of reliability for the subscales (.82 to .93) and convergent validity across a number of studies with variations in participant ethnicity, clinical profile, and criterion measures (e.g., [12, 21]). Additionally, the DASS-21 stress subscale has shown correlations from .65 to .76 with the widely used Perceived Stress Scale [9] and correlations of .73 to .88 with the Children's Depression Inventory [26, 37].

The third instrument, the Armstrong Laboratory Aviation Personality Survey (ALAPS, [38]), was developed in conjunction with the United States Aerospace Medicine Directorate's Clinical Sciences Division, Brooks Air Force Base, Texas, as a measure of personality characteristics of pilots and as a screening instrument. The ALAPS was factored into 16 dimensions with Cronbach's alphas of .70 or greater for each factor cluster [25]. The ALAPS had significant overlap with the NEO-PI-R and was comparable in prediction of outcomes for screened pilots-in-training.

2.3 Procedure

The study was reviewed and approved by the Institutional Review Board (IRB) at The Citadel, Charleston, South Carolina. Data were collected via SurveyMonkey. Participants were solicited by contacting pilot groups and through dissemination of the SurveyMonkey link to a list of known pilots who were asked to forward

the survey link to other pilots. All responses were anonymous.

Additional information collected included extensive demographic data such as age, gender, education, ethnicity, hours of flying, type of aircraft, type of training, general area of primary responsibility (i.e., military, commercial, etc.).

Data were analyzed using SPSS-17. Fluctuations in the degrees of freedom for various analyses reflect case drops due to missing information on one or more of the variables.

3 Results

Comparisons were made by gender across variables using independent *t*-tests to identify any significant differences. Effect size was computed using $\tilde{\omega}^2$ following Sheskin [40] with ranges defined by Cohen [9] as follows: less than or equal to .0588, small effect size, greater than .0588 but no more than .1379, medium effect size, and greater than .1379, large effect size.

There were no significant differences in age between males (M =44.98, SD=10.74) and females (M=42.10, SD=16.46), $t(79)=0.85$, $p=.402$, years of flying experience (mean for males=19.87, SD=10.87, for females, 19.06, SD=13.83), $t(81)=0.28$, $p=.784$, median hours of flying experience, Mann-Whitney $U(83)= -0.005$, $p=.996$, and mean hours of experience as an instructor, $t(50)= -0.96$, $p=.349$, or highest flight certification, $t(76)= -0.94$, $p=.35$.

On the DASS-21, there were no significant differences between males and females in their depression score (M=9.66 and 9.59, respectively), $t(61)= 0.68$, $p=.497$, stress score (M=7.88 and 7.63, respectively), $t(61)= 0.11$, $p=.911$, or anxiety score (M=7.68 and 7.71, respectively), $t(60)=-0.09$, $p=.926$.

On the AGAQ there was a significant difference between males and females across all four factors. On Flying Proficiency, males rated themselves as more proficient than females (M=62.03) while females significantly rated male Flying Proficiency considerably lower (M= 45.50), $t(59)=4.09$, $p<.001$, $\tilde{\omega}^2=.21$. On Safety Orientation, male pilots again rated themselves as safer than female pilots (M=30.06) while female pilots rated male Safety Orientation significantly lower (M=27.04), $t(65)=3.40$, $p=.001$, $\tilde{\omega}^2 =.14$. On Flight Confidence, males rated themselves high (M=17.36) while females rated males significantly lower on Flight Confidence (M= 14.95), $t(66)=2.35$, $p=.022$, $\tilde{\omega}^2 =.06$. Males agreed that there was an Erosion of Flight Standards specific to female pilots (M=9.20) while females significantly disagreed with that perception (M=5.48), $t(59)=5.38$, $p<.001$, $\tilde{\omega}^2 =.30$.

AGAQ questions were regrouped into four categories--positive male attributes, positive female attributes, negative male attributes, and negative female attributes. A comparison of genders indicated that females did not perceive males as being as positive on positive male attributes as did males (M=27.47 and 37.74, respectively), $t(62)=3.94$, $p<.001$, $\tilde{\omega}^2 =.19$, but did not significantly see males in a negative light (M=11.62 and 10.97, respectively), $t(67)= -1.34$, $p=.186$. Males, however, saw females as being low across positive female attributes (M=27.00) and high on negative female attributes (M=40.54) in comparison to female perceptions, $t(63)=2.42$, $p=.016$, $\tilde{\omega}^2 =.07$ and $t(62)=4.67$, $p<.001$, $\tilde{\omega}^2 =.24$. In other words, females seemed to be saying that males are not as great as pilots as they think they are, but they are not bad, either. Males seemed to be saying that female pilots are not great as pilots, period, and they are just as bad as has always been perceived by male pilots.

Male pilots who consistently shared the flight deck with the opposite gender were more equitable toward the other gender as opposed to male pilots that rarely or never shared the flight deck with the opposite gender. Specifically, male pilots who had shared flight decks rated females as significantly higher on flying

proficiency, $t(50)=2.884$, $p=.006$, $\tilde{\omega}^2 = .13$, safety orientation, $t(50)=3.21$, $p=.002$, $\tilde{\omega}^2 =.16$, and having positive attributes, $t(51)= 2.469$, $p=.017$, $\tilde{\omega}^2 =.09$, than did male pilots who had not shared the flight deck with females.

In comparing female pilots to female non-pilots with the ALAPS, independent *t*-tests indicated significant differences on Confidence with female pilots higher (means of 11.09 and 8.65, respectively), $t(45)= -3.302$, $p=.002$, Depression with non-pilots higher (means of 4.53 and 2.67, respectively), $t(45)=2.024$, $p=.049$, Dogmatism with female pilots higher (means of 10.71 and 8.00, respectively), $t(45)= -3.41$, $p=.001$, and Risk Taking with female pilots again higher (means of 10.95 and 8.33, respectively), $t(52)= -2.669$, $p=.001$. These findings support the findings by Novello and Youssef [36] with one caution; female pilots were significantly older than the non-pilot group (mean ages of 43.87 and 33.03, respectively), $t(52)= -3.008$, $p=.004$. Thus, age, as related to maturity, may have accounted for these differences. Even so, these patterns from the female pilot group do parallel previous findings with male pilots, suggesting that female pilots are more like their male counterparts than females as a whole [25].

4 Discussion

Despite research that suggests that female pilots are at greater risk for harassment, ostracism, negative perceptions, and sexism [13, 14, 33], the DASS-21 did not indicate any greater degrees of depression, stress, or anxiety in females pilots in what has been, and is still seen, as a male dominated profession. Indeed, this group of female pilots compared very favorably to male pilots across those factors that pilots use to judge the worth of another such as flying experience, hours of flying, variety of flying opportunities, etc., thus suggesting that female pilots were no less prepared or trained than male pilots. The perception, and in these data, the actuality of equal training and preparation by females seems to be a leveling factor that may ward off the effects of negative male perceptions of females as pilots, thus negating female tendencies toward self-devaluation leading to depression, additional stress, or anxiety. Additionally, as suggested by Germain et al. [19], male attitudes may have already taken their toll on female pilots such that many females quit before finishing their training and those females left behind are a hardier lot less influenced by male attitudes.

Females also seem to be more accepting of the positive qualities of their male counterparts, perhaps suggesting that males are not as great as they think they are, but then, males are not bad pilots, either. Males, on the other hand, seem to hold to a more negative view of female pilots across the board, suggesting that males see female pilots as not being very good at flying a plane and, in fact, as being pretty bad at flying a plane. Thus, tolerances do not appear to be equal across the genders. There is then what appears to be sexism among males pilots based on AGAQ responses, but not a return sexism by female pilots. Additionally, female pilots in this study do not seem to have internalized the negative male image of female pilots, preferring to see themselves as equal and, indeed, according more equality between the genders than accorded by males.

Part of the ability for female pilots to survive in such a male-dominated profession may be due to personality characteristics. Much additional research, however, needs to be conducted in this area before any substantive conclusions can be reached.

Within the data were a small group of males who had flown with female pilots on the flight deck 25% of the time, and another group of males who had flown with female pilots on the flight deck 75% of the time. Familiarity seems to breed greater cross-gender respect with those males who have shared the flight deck with females 75% of the time according females nearly equal status to males across all factors of the AGAQ. While the increases in scores by the 75% males over the 25% males were not significant, it was nevertheless a uniform pattern

of higher ratings by males who frequently shared the flight deck with female pilots.

Findings from the ALAPS suggest that females are unlike their non-pilot group relative to some personality characteristics. They tend to be more confident, a necessary characteristic when one thinks of the responsibilities of flying. They tend to be more dogmatic, again necessary when one thinks of the system checks and lock-step sequences that must be gone through preparatory to flying and during actual flight. They are less prone to depression, perhaps secondary to the very active demands of piloting. And they tend to be greater risk takers, again, consistent with the profession of flying.

During the course of this research the authors were privileged to email traffic between some male pilots who had been asked to take the survey (no such e-mail traffic took place with female participants). While the email traffic was obviously sent in jest between male colleagues, some of the comments vividly illustrate the underlying thoughts of some male pilots toward female pilots. As examples, the following were comments made by male participants: comment 1: "Also, no female pilots were injured or harmed in any way, shape or form at my hands during my career (other than at their personal request); " comment 2: "I'm sure most of us would agree, female pilots would be better served sticking to acts of distaff [a woman's domestic work] than aviating;" and while quite off-colored, comment 3: "beavers are for after flying…" . Such comments perhaps lend support to the conclusions drawn from these data that males are less accepting of females than females of males on the flight deck.

5 Conclusions and Recommendations

Female pilots operating in the male-dominated airline industry are an understudied group [19]. Germain et al. [19] suggested that female pilots may be working in one of the most gender-incongruent (i.e., male-specific) of work environments. As such, one would expect negative psychological consequences as indicated by increased levels of stress, anxiety, and depression among female pilots.

This study was undertaken to examine whether such gender related perceptions by male pilots of female pilots in the United States and Europe would lead to increased stress, anxiety, and depression by female pilots specific to the gender-incongruence of their occupational setting. Additionally, female pilot personality characteristics were examined for potential impact on stress, anxiety, and depression by female pilots secondary to the male pilot specific work environment. Particularly if it was found that there was an absence of stress, depression, and anxiety, contrary to what would be expected when females invade a male-dominant occupation, then female pilot personality characteristics might, potentially, be a major mitigating factor.

The results of this study suggest that the element of sexism, with possible concomitant isolation and harassment of female pilots, is still present among male pilots in the U.S. and Europe; however this sexism does not seem to lead to greater degrees of depression, stress, or anxiety in female pilots as compared to their male counterparts. These data also suggest that the absence of expected increases in depression, stress, or anxiety among female pilots may be due to their dissimilarity to their non-pilot females peers in the general population relative to certain personality characteristics, specifically, higher levels of confidence, dogmatism, and risk taking, and lower levels of depressive symptomatology. These personality characteristics, based on reviewed research, appear to align more closely with personality characteristics of male pilots.

Commercial aviation might be considered a *high load* occupation, e.g., high in responsibility, high in consequence for any wrong decision, and high in skill levels and decision making required. It would be interesting to compare female pilots with females in other high load occupations, such as medicine, etc., to examine the extent to which personality characteristics might overlap

between females pilots and females in other high load occupations.

Germain et al. [19] suggested that female pilots who have survived in the piloting occupation must show greater than normal degrees of self-efficacy and self-confidence. This is an observation that has both intuitive merit and some research support, particularly for the confidence characteristic. Future research may want to investigate personality characteristics of female pilots more extensively with regard to degree of overlap with male pilots, e.g., convergence of characteristics, and divergence with females in general. Further investigations into this particular area may help to delineate further those attributes that may permit females pilots to survive, without apparent negative psychological impact, the still hostile and sexist environment of the airline pilot industry.

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