Journal of Aviation/Aerospace Education & Research

Volume 31 | Number 2 Article 5

2022

An Analysis of the Effect of Self-Efficacy of Female Students in Collegiate Flight Programs

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Introduction

Women continue to represent a small minority in the aviation industry with little growth in the last ten years. In 2010, roughly 3.9% of Federal Aviation Administration (FAA) Air Transport Pilot (ATP) certificate holders were estimated to be women (FAA, 2019) with only a slight increase in that percentage to 4.5% in 2019 (FAA, 2019). Representation of women in collegiate aviation programs has not fared much better. According to the U.S Department of Education's National Center for Education Statistics (2018), 2,596 students received a bachelor's degree in an aviation-related field in 2018. Of the 2,596 total students, 2,264 were male and 642 were female. The low number of women represented in collegiate aviation demonstrates a need to address diversity.

The purpose of this study is to examine the social cognitive career theory (SCCT) element of self-efficacy, its perceived level by collegiate aviation program students, and to discern any possible gender differences by noting SCCT's influence in collegiate aviation programs to see if male aviation students have higher levels of self-confidence to help explain the gender representation gap in the aviation industry. This study hypothesized that:

Male aviation students display a higher level of self-efficacy than female aviation students, demonstrating cause to the presence of a gender representation gap in the aviation industry.

Review of Literature

The initial search for literature concerning self-efficacy and the application of SCCT among collegiate aviators, specifically women, produced no research on the issue. Research literature on gender in collegiate aviation that was found was often "old," dating a decade or more since publication. It mostly focused on gathering baseline data, student perceptions of

women in aviation, or perceived gender barriers and negative gender biases in relation to flight training (Ison, 2010; Ison et al., 2016; Mills et al., 2016; Sulton, 2019; Turney, 2000). While these are excellent and proven indicators of factors external to the female student that may influence women in aviation, they do not tap into the internal cognitions that also may be affecting gender diversity in aviation. Additionally, these previously mentioned studies often lacked an established theoretical framework upon which the studies were based.

In expanding the search for related literature, the researchers found that some studies touched upon the self- efficacy element of the SCCT, a well-established theoretical framework used to assess both internal and external factors concerning career (and education leading to career) continuance. In the literature, authors often referred to self-efficacy in layman's term, such as "self-confidence" or "confidence." This literature review will address the following topics: the relevance and lack of diversity in aviation; a representation of research concerning barriers to female students in collegiate aviation programs; the theoretical basis of the concept of self-efficacy as an element of SCCT; and the reliability and validity of a self-efficacy measurement tool, the General Self-Efficacy Scale (GSES).

Diversity in Aviation

Cultural and societal views hold strong when it comes to diversity in the workplace and gender equality, especially in industries like aviation that are traditionally viewed as best suited for men. Other Science Technology Engineering and Mathematics (STEM) industries and disciplines have experienced a small growth in a diversified workforce but have not kept up with national statistics concerning diversification of the general population (Ison et al., 2016). The idea of diversity in STEM, both in higher education and in the workplace, is well accepted with multiple sources touting the benefits of robust learning environments, increased talent

acquisition, innovation, and increased productivity (Barak, 2005; Fassinger, 2008; Ison et al., 2016; Mannix & Neale, 2005; Perkins & Szakal, 2020; Umbach, 2006). Perkins and Szakal (2020) address potential safety implications in aviation due to implicit bias generated from a highly homogenized industry. They state, "biases formulated through societal and cultural influences can lead to the mischaracterization of a group or the perpetuation of outdated models. When this happens, our ability to interact collaboratively is diminished and safety is compromised" (Perkins & Szakal, 2020, p. 1). With the benefits of diversity understood, where is the disconnect between idea and reality, theory and practice, potential versus concrete numbers?

Women in Collegiate Aviation

In 2010, Ison cited a lack of research on the involvement of women in higher education. Ison sought to provide baseline information for future studies that quantitatively assess completion rates of female students in four-year flight programs, aviation faculty positions filled by women, and aviation-based academic leadership positions held by women. Utilizing data on flight students and faculty mined from the Integrated Postsecondary Education Data System (IPEDS), the University Aviation Association (UAA) College Aviation Guide, and specific college websites, Ison examined numbers from a ten-year time frame (1997 to 2007). Results demonstrated that while female involvement in academia, both at the student level and faculty level, was two-to-three times higher than the involvement found in the aviation industry, the overall level of involvement at the student level remained relatively unchanged over the ten-year period. Additionally, in 2016 Ison et al. conducted a follow up study to further determine the state of diversity data in collegiate aviation almost ten years later. Utilizing a similar method of collecting descriptive data from IPEDS for years 2004 to 2014 and comparing it with the

previous study of the 1997 to 2007 period, Ison et al. (2016) found that diversity participants (defined as an ethnic minority and/or female) in collegiate aviation was still higher than that in the industry, 27.3% versus 18.4%. However, female participation demonstrated a disappointing negative trend over the full seventeen-year analysis. One of the five recommendations was to "investigate how to improve participation rates of those groups that did not have favorable trends, such as women and Native Americans" (Ison et al., 2016, p. 32).

Studies have been conducted to ascertain aviation program students' attitudes and perceptions of female aviators (Depperschmidt & Bliss, 2009; Luedtke, 1994; Thornberg et al., 1995). These studies have revealed external barriers that are perceived by female flight students such as the following: communication style differences, lack of female mentors and role models, perceived discrimination and prejudice, feelings of isolation, and lack of learning style understanding (Depperschmidt & Bliss, 2009; Ison, 2010; Karp et al., 2001; Luedtke, 1994; Sloan, 2006; Thornberg et al., 1995). While each of these studies addresses the external motivators and barriers at play in a female student's persistence in collegiate aviation, a deeper understanding of the internal motivators and distractors found in their cognitions is not addressed.

Social Cognitive Career Theory and Self Efficacy

Social cognitive theory asserts that human behavior is determined by the interaction of three factors: environmental, behavioral, and cognitive (Bandura, 1986). Self-efficacy, an element of behavioral factors, deals with an individual's belief in their capacity to address a certain set of circumstances (Bandura, 1977, 1986). Social Cognitive Career Theory (SCCT) developed by Lent et al. (1994, 2000) illustrates that self-efficacy and outcome expectations contribute toward career interests, which in turn, influence intention/goals and implementation

strategies to accomplish the set goals. While self-efficacy is influenced by both internal and external factors, it has been established that one's self-efficacy is most readily and effectively changed (Betz & Schifano, 2000). The development of self-efficacy is important because it has been linked strongly and consistently to many critical educational and occupational outcomes such as aspiration, persistence, achievement, career interests, occupational choices, employment, and satisfaction (Fassinger, 2008). These statements provide additional rationale for the hypotheses to be examined in this study.

In addition, self-efficacy has proven to be a useful construct in determining resilience and retention of women and other minorities in other collegiate STEM programs (Bhatt et al., 2020; Carpi et al., 2017; da Silva Cardoso et al., 2013; Garriott et al., 2013; Lent et al., 2000; Mastekaasa & Smeby, 2006; Soldner et al., 2012; Tellhed et al., 2017).

Most recently, Bhatt et al. (2020) conducted an exploratory study that examined the participation motivators of ethnic minorities and women and their involvement in Biomedical Career Enrichment Programs (BCEP) utilizing the theoretical framework of social cognitive theory and theory of planned behavior. A multiple comparative case study design was used in conjunction with a robust interview process involving undergraduate students at Rutgers University. Coding of interview answers was applied with the following themes emerging: specific career goals guiding interest in BCEPs; self-efficacy beliefs were influenced by duration of BCEP participation; influence of friends and family; and long-duration BCEP experience negatively affected research career intent. To determine the effect of undergraduate research experience (URE) on self-efficacy and career goals for minorities in STEM programs, Carpi et al. (2017) utilized the framework of SCCT. A case study approach was used with 47 college students. Nearly three quarters of participants represented minorities in STEM with all

participating in PRISM. PRISM is a program of excellence with the mission to, "provide access to a high-quality mentored undergraduate research experience while addressing known barriers for underrepresented and under-privileged students" (p. 177). Elements of the PRISM program include the following: recruitment, mentorship, community, addressing of financial barriers, professionalization, and post-baccalaureate planning. Survey results showed a marked increase in self-efficacy, especially among women, as a result of URE through the PRISM program. Additionally, female participants showed an increase in intention to attend a post-baccalaureate program by 52% (Carpi et al., 2017), demonstrating resilience and retention in a chosen field.

Like this study, Tellhed et al. (2017) conducted a study on 1,327 Swedish youth to determine gender differences in self-efficacy and what researchers termed "social belongingness" through the SCCT framework. The researchers' intent was to discover why women are less drawn to STEM college majors and why men are less drawn to Healthcare, Elementary Education, and Domestic (HEED) college majors. Results showed that while self-efficacy and "social belongingness" showed significance in women's college major choice, less frequently choosing STEM majors, only "social belongingness" demonstrated to have an effect on men's college major choice steering them away from HEED majors. In other words, men believed they could perform well in either discipline, but felt they would "not fit in" in HEED majors. Women had the double barrier of not only believing they were incapable of performing well in STEM majors (a stronger indicator between the two constructs), but that they would also "not fit in" (Tellhed et al., 2017).

Soldner et al. (2012) also conducted a mixed method study of 110,682 students participating in Living/Learning STEM programs at 46 universities across the United States. Similarly, female students held less "confidence" or self-efficacy in their ability to perform well

in the STEM major, even though their grades were high and typically higher than their male counterparts. Additionally, the higher the students' indicated self-efficacy, regardless of gender, the higher their indicated intent to remain in the STEM major chosen. Results from these studies provide additional rationale for the hypotheses to be examined in this study.

In studies related to gender differences of students in collegiate flight programs, self-efficacy has been touched upon indirectly using the term, "confidence" or "lack of confidence" (Germain et al., 2012; Mitchell et al., 2006; Turney, 2000; Vermeulen & Mitchell, 2007). However, as previously stated, formal application of SCCT, specifically focusing on the element of self-efficacy and its influence on female students in collegiate flight programs, could provide the needed theoretical baseline and future direction for additional studies concerning diversity in an otherwise highly homogenized industry.

Germain et al. (2012) conducted a study "to identify strategies to promote women's success in general aviation" (p. 436). More specifically, the authors sought to improve policy and practices in the field of Human Resource Development (HRD) by conducting this research under the construct of social cognitive theory. The methodology included the use of a 12-item survey sent over a two-year period, which yielded 296 responses usable for qualitative and quantitative analysis. Results and recommended changes to HRD included the following: perception of women's acceptance; perceived isolation due to lack of role models, networks, and mentors; lack of HRD's role in identifying and developing talent in the female minority group; and *a lack of female self-efficacy in flight training*. This article speaks to flight training situations in general aviation where 33% of respondents indicated that they pursued flight training due to "fulfilling a dream/bucket list." The article did not specifically speak to the collegiate flight instruction

setting where flight instruction pursuits are more likely to be intentional and career-driven, hence the need for this research to discern self-efficacy influence in a more career-driven population.

Generalized Self-Efficacy Scale (GSES)

Schwarzer (1992) sought to create a valid and reliable measurement tool to assess generalized self-efficacy within the framework of SCCT. The GSES addresses the growing interest in generalized self-efficacy beliefs, as opposed to career situation-specific beliefs measured through other self-efficacy measurement tools, such as Career Decision Making Self-Efficacy Scale (CDMSE), the Career Decision Scale (CDS), and My Vocational Situation (MVS) (Betz & Taylor, 1994; Holland et al., 1980; Osipow, 1987; Taylor & Betz, 1983). The GSES "assesses the strength of an individual's belief in his or her own ability to respond to novel or difficult situations and to deal with any associated obstacles or setbacks" (Schwarzer, 1992, p. 35).

The GSES is a self-administered scale consisting of ten questions answerable by a four-point Likert scale offering the respondents the options of Not At All True, Barely True, Moderately True, or Exactly True. Examples of GSES questions are, "I can always manage to solve difficult problems if I try hard enough," and "When I am confronted with a problem, I can usually find several solutions" (Schwarzer, 1992, p. 37). Answers for each question correspond to a graduated point system with "Not At All True" indicating lower self-efficacy receiving a score of 1, and "Exactly True" indicating higher self-efficacy receiving a score of 4. The scores for each question are summed resulting in a composite total score of 10 to 40, reflecting the strength of the respondent's perceived self-efficacy. For comparison purposes, accumulated data is available via a SPSS downloadable data set from over 18,000 participants (Schwarzer, 2020).

The GSES is unidimensional in nature with validity established in multiple correlation studies (Luszczynska, Gutierrez-Dona, & Schwarzer, 2005; Luszczynska & Schwarzer, 2005; Schwarzer, 1993; Schwarzer et al., 1996; Zhang & Schwarzer, 1995) with concurrent validity demonstrating positive correlations with self-esteem and optimism and negative correlations with depression, shyness, and anxiety (Schwarzer, 2014). Reliability has been established with high internal consistency ratings ranging from .76 to .90 with the average in the high .80s (Luszczynska, Gutierrez-Dona, & Schwarzer, 2005; Luszczynska, Scholz, & Schwarzer, 2005; Luszczynska & Shwarzer, 2005; Scholz et al., 2002; Schwarzer, 1993; Schwarzer, 2014; Schwarzer et al., 1996; Zhang & Schwarzer, 1995). In the "U.S.-American adult population, T-norms were derived from a sample of N = 1,594 U.S.-American adults. In this sample the mean was found to be 29.48, standard deviation equaled 5.13. Gender was equally distributed, male 50.9%, female 49.1%" (Schwarzer, 2014, p. 4).

Methodology

The research utilized a mixed-methods sequential explanatory design that consisted of quantitative and qualitative methods. According to Green et al. (1989) quantitative and qualitative methods complement each other and allow for a more robust analysis by taking advantages of the strengths of each. Quantitative data was collected and analyzed followed by a collection and analysis of qualitative data to assist in explaining and interpreting the findings of this study.

Research Question

The following research questions guided this study:

- What effect does the element of perceived self-efficacy have on women in collegiate aviation flight programs?

- What effect does the element of perceived self-efficacy have on men in collegiate aviation flight programs?
- Do self-efficacy responses differ between female and male collegiate aviation students?

Research Population and Data Collection Method

The population for this study consisted of students enrolled in four-year collegiate aviation programs, as found through the University Aviation Association (UAA) membership rosters. The researchers sent emails to faculty members listed on the UAA roster asking for their assistance in this study. The email invited faculty to participate with a provided Qualtrics electronic survey link to forward to their collegiate aviation students. After approximately two weeks, the researchers sent an additional follow up email reminder to faculty. Approximately 30 days after the initial email was sent to faculty, the survey was deactivated, and data were analyzed for this study. Because of the anonymity of the survey, institutions that participated were not identified and any mention of specific universities was redacted in the personal comment section. Permission to conduct this study and solicit this research instrument was approved by the Institutional Review Board at Oklahoma State University (approval # IRB-21-111).

Research Instrument

The research instrument utilized in this study consisted of three parts. The first part of the research instrument sought demographic information about participant's age, gender, declared aviation major, geographic location, and academic year classification. The second part of the research instrument utilized the GSES to solicit individual responses regarding perceived self-efficacy of collegiate aviation students. For the ten questions on self-efficacy asked through the

GSES, Likert-scale statements in an ordinal measurement pattern provided respondents the options of Not At All True, Barely True, Moderately True, or Exactly True. This 0-4, forced-response, Likert-scale does not offer a neutral choice. The last section of the research instrument was a personal comment section for students.

Data Analysis

To analyze the results of this study all data was downloaded from Qualtrics survey software and imported into SPSS statistical software. The results from this study were analyzed using descriptive statistics, Cronbach's alpha, and an independent t-test. For the qualitative portion of this research, the researchers coded and organized students' personal responses into themes and then formed an interpretation of them. As suggested by Creswell and Creswell (2018), the researchers identified significant statements that were left in the personal comment section and clustered them into themes to incorporate in the results and discussion section.

For the quantitative portion of this research, descriptive statistics were utilized to summarize data through means, percentages, and frequency distributions in an effort to communicate trends and possible conclusions. According to Laerd Statistics (2015), descriptive research helps describe, show, or summarize data using percentages, rates, ratios, graphs, and frequency distributions. The Likert-scale statements utilized in the research instrument were analyzed for internal reliability using Cronbach's alpha. Cronbach's alpha is a formula used to estimate internal consistency based on a determination of how all items on a test compare to all other items and to the total test (Gay et al., 2006). According to Yang and Green (2011), an alpha coefficient is generally regarded as one of the most used scales of reliability due to its ease of interpretation and objectiveness. George and Mallery (2003) have established the following Cronbach's alpha acceptance scale: "> .90 – Excellent, > .80 – Good, > .70 –

Acceptable, > .60 – Questionable, > .50 – Poor, and < .50 – Unacceptable" (p. 231). In addition to internal reliability and descriptive statistics, the research utilized an independent t-test to discern if a statistical difference exists between male collegiate flight students' self-efficacy responses and female collegiate flight students' self-efficacy responses to aid in answering the research question, "Do self-efficacy responses differ between female and male collegiate aviation students?" The research utilized an independent t-test to discern if a statistical difference exists between the measured self-efficacy of collegiate flight students and the American adult population to aid in answering the research question, "What influence does the element of perceived self-efficacy have on females in collegiate aviation programs and the aviation industry?"

Results

Collegiate Aviation Students Demographic Information

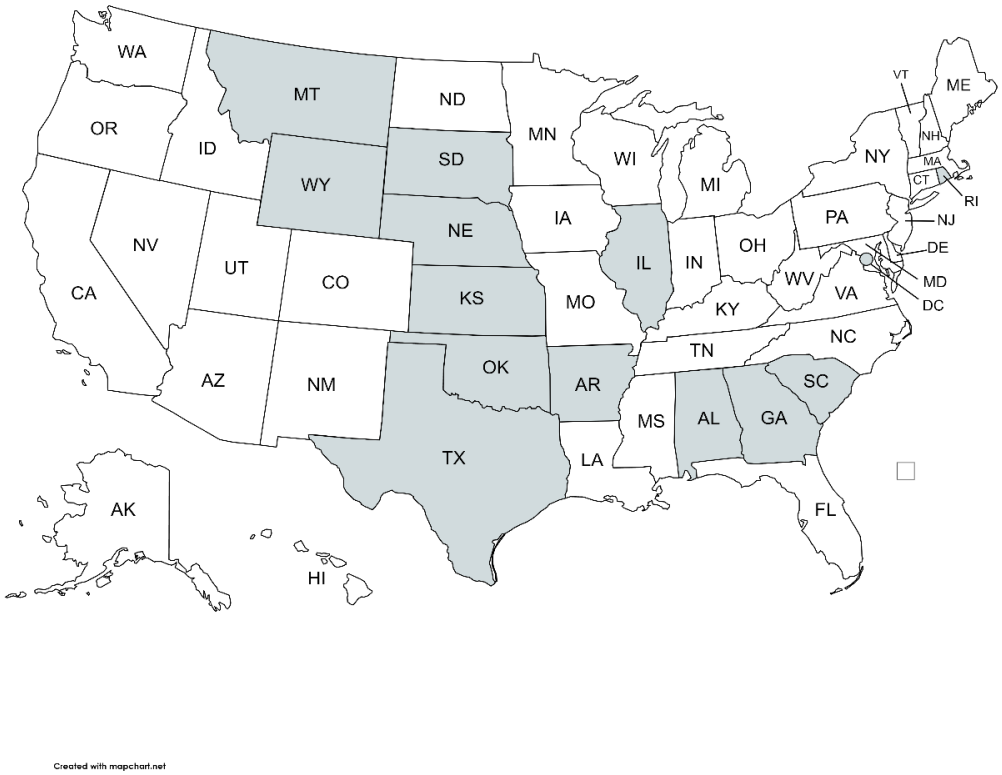
The first section of the research instrument sought demographic information about the participant's gender, grade classification, aviation major, and geographic location. The first question of the research instrument asked participants to identify their gender. Of the total 145 students that responded, 61% identified as male aviation students and the remaining 39% were female aviation students. Question two of the demographic section asked participants to identify their grade classification. Twenty-one percent (21%) identified as first-year, 25% as second-year, 30% as third-year, and 24% identified as fourth-year.

The third demographic question asked collegiate aviation student participants to identify their current aviation major. Sixty-nine percent (69%) of students identified their aviation majors as professional pilot, aeronautical science, or professional flight. Twenty percent (20%) identified their majors as aviation management, while the remaining 10% selected "other." To

identify the various locations of research participants, the final demographic asked students to identify geographically where they are located. Figure 1 depicts shaded states of self-identified geographic location of participants.

Figure 1.

Geographic Location of Collegiate Aviation Students



Note. Puerto Rico is not pictured.

The second section of the research instrument utilized ten Likert-scale statements on self-efficacy asked through the GSES. Table 1, *General Self-Efficacy Scale of Collegiate Flight Students,* shows the results from these statements.

Table 1

General Self-Efficacy Scale of Collegiate Flight Students

Likert Statement	Not at all true	Barely true	Moderately true	Exactly true
I can always manage to solve difficult problems if I try hard enough.	0.69% n = 1	0.69% n = 1	51.39% n = 75	47.22% n = 68
If someone opposes me, I can find a means and ways to get what I want.	4.05% n = 6	22.92% n = 33	59.02% n = 86	13.89% n = 20
It is easy for me to stick to my aims and accomplish my goals.	1.39% n = 2	6.25% n = 9	47.22% n = 69	45.14% n = 65
I am confident that I could deal efficiently with unexpected events.	0.69% n = 1	4.86% n = 7	44.44% n = 64	50.00% n = 73
Thanks to my resourcefulness, I know how to handle unforeseen situations.	0.69% n = 1	6.25% n = 9	50.00% n = 72	43.75% n = 63
I can solve most problems if I invest the necessary effort.	0.69% n = 1	1.39% n = 2	27.77% n = 40	70.14% n = 102
I can remain calm when facing difficulties because I can rely on my coping abilities.	2.83% n = 3	14.58% n = 21	34.72% n = 50	48.61% n = 71
When I am confronted with a problem, I can usually find several solutions.	0.69% n = 1	8.33% n = 12	47.22% n = 69	43.75% n = 63
If I am in a bind, I can usually think of something to do.	1.39% n = 2	6.94% n = 10	46.53% n = 68	45.14% n = 65
No matter what comes my way, I'm usually able to handle it.	1.39% n = 2	3.47% n = 5	39.58% n = 57	55.56% n = 81

The last section of the research instrument was a personal comment section where 54% of collegiate aviation students summarized their own personal experiences, comments, concerns,

and observation regarding self-efficacy and the existence of gender biases and barriers in collegiate aviation and the U.S. aviation industry. Participant's personal comments will be interpreted in the discussion section.

Analysis

A Cronbach's alpha analysis indicated a coefficient of 0.846 (good reliability) based on the George and Mallery (2003) scale. Table 2 demonstrates the difference in male collegiate flight students' self-efficacy responses and female collegiate flight students' self-efficacy responses.

Table 2

Male/Female Self-Efficacy Responses

	Females	Males
	Variable 1	*Variable 2*
Mean	3.280701754	3.417045455
Variance	0.037618413	0.056217
Observations	10	10
Hypothesized Mean Difference	0	
Df	17	
t Stat	-1.407510662	
P(T<=t) one-tail	0.088649003	
t Critical one-tail	1.739606726	
P(T<=t) two-tail	0.177298006	
t Critical two-tail	2.109815578	

In completing the two-tail test (inequality), if t Stat < -t Critical two-tail or t Stat > t Critical two-tail, the null hypothesis is rejected that self-efficacy responses are equal between female and male collegiate aviation students. This is not the case, -2.109 < -1.407 < 2.109. Therefore, the null hypothesis was not rejected. The observed difference between the sample means (3.28 - 3.41) is not convincing enough to say that the average level of self-efficacy between female and male students differ significantly. However, in completing an independent t-test between the research sample and the generalized American adult population (Schwarzer,

2014), results statistically demonstrate at the 95% confidence interval that collegiate aviation students display a higher level of self-efficacy than the average American adult, as seen in Table 3.

Table 3

Collegiate Aviation Student/American Adult Self-Efficacy Responses

Descriptive Statistics

Sample	N	Mean	Standard Dev	SE Mean
Collegiate Aviation Students	145	33.45	6.47	0.54
American Adult Population	1594	29.48	5.13	0.13

(Schwarzer, 2014)

Estimation for Difference

	Difference	95% CI for Difference
	3.970	(2.878, 5.062)

T-Value	DF	P-Value
7.18	160	0.0000000000

Discussion

The General Self-Efficacy Scale (GSES) assesses the strength of an individual's belief in his or her own ability to respond to novel or difficult situations and to deal with any associated obstacles or setbacks. Overall, the findings of this study indicate that collegiate aviation students expressed a high level of confidence, even greater than the general American population, when it comes to problem solving, goal setting, and dealing with unforeseen circumstances. All of which are necessary in a highly dynamic industry with marginal room for error such as aviation.

To understand and explain the gender representation gap in the aviation industry, this research sought to identify if a difference exists between male collegiate aviation students' self-efficacy responses and female collegiate aviation students' self-efficacy responses. The

researchers hypothesized that because the aviation industry is male dominant that male aviation students would display a higher level of self-efficacy than female aviation students.

In addition to analyzing students' self-efficacy responses to identify and understand why a gender representation gap exists in the aviation industry, the research also sought students' personal comments and perceptions to aide in explaining why. According to the independent t-test, a statistical difference did not exist between male and female collegiate flight students' self-efficacy responses. The researchers found the results from students' self-efficacy responses and personal comments interesting because both male and female students expressed high confidence levels on their survey responses, but in the personal comment section, students--especially female students--commented about their experiences of what it's like to be women in aviation and gave their opinions of the potential reasons behind industry underrepresentation.

Over half (54%) of students that responded in the personal comment section gave their own personal experiences and observations regarding women in aviation, with common themes concerning perceived gender bias and barriers emerging. The most common trend seen in the personal comment section was overall students' awareness that aviation is highly homogenized and predominately male. To illustrate this perception of imbalance, one student wrote "The most prominent element I have noticed is that there are few females within my degree. For example, my first day of class, I was in a classroom of 30 individuals and three of us were females. I did not expect anything else; it is just crazy to actually witness the ratio of females to males." This student's personal comment exemplifies the industry-wide statistical average of underrepresentation of females in aviation. Another student wrote about her personal experience of gender imbalance in collegiate aviation. She explained, "I am often the only woman in my aviation courses. While our program and its students are very inclusive at face value, there are

little things said or done that remind you of you're not 'one of the boys'." To give a different gender perspective, one student wrote about the imbalance at his university saying, "As a male, I can't speak for much of the gender issues women face in aviation, but in my experience, all related aviation classes have relatively very few women compared to men in the class. I think the largest barrier is that it has been ingrained in our society that a pilot is a man's job and very few women desire to become pilots." He continued by saying, "This may be due to a lack of representation."

Another common response that collegiate aviation students suggested multiple times in the personal comment section is the need for equal representation of gender in the student population and the work force. Students emphasized this need by specifically mentioning the increased need for female representation in leadership positions such as female professors and flight instructors beginning at the university level and continuing to the cockpit at the industry level, echoing the results found by Ison et al. (2016). One student wrote, "As a woman in aviation, I have a unique perspective on the aviation industry. Growing up, I didn't really have any female pilot mentors or role models. It just seemed like aviation was a man's job." An additional student wrote, "I would like to see the addition of female professors, administrators, and flight ops staff. While there are women on faculty and helping with flight team, there is only one female CFI. I'd like to see more support/help for women to succeed in those roles." Another student wrote about her own experience on how the industry typically only includes men in leadership roles. The student explained "It does seem like I have many more male students in class than female, as I have seen much more male pilots in the cockpit than female when flying at my own personal vacations." As a result of male dominance in aviation many female students expressed that they feel they must outwork or work twice as hard as their male counterparts to

fill the void of the gender gap in aviation. One female student wrote, “I see a disproportionate amount of women in aviation. I won't lie, I am intimidated by this fact. The gap between men and women pushes me to do better, though. I feel like I have something to prove.”

Conclusion

Overall, collegiate aviation students responded with high self-confidence levels, compared to the general population, when given several circumstances. Student respondents felt confident in their abilities to manage difficult situations, accomplish their goals, remain calm in high stress situations, and find solutions to problems regardless of their gender, grade classification, or geographic location. Students’ self-efficacy responses were very encouraging to the researchers because the aviation industry requires high self-confidence and has marginal room for error. However, questions remain when considering the gender representation gap in aviation. If male and female collegiate aviation students have similar beliefs in their abilities to respond to difficult situations and to deal with any associated obstacles or setbacks, then why is there a representation gap in the aviation industry? The researchers assume that because collegiate aviation students responded similarly in their confidence in abilities, but more in depth in the personal comment section, that the result of the gender gap representation does not come from lack of unequal levels of self- confidence, but rather from a multitude of other things mentioned in the personal comment section like personal experiences, gender barriers/biases, lack of gender association, and industry representation. This has been supported in previous studies concerning the disparity of women in aviation (Depperschmidt & Bliss, 2009; Ison, 2010; Karp et al., 2001; Luedtke, 1994; Mills et al., 2016; Sloan, 2006; Sulton, 2019; Thornberg et al., 1995; Turney, 2000). In responses to the personal comment section, collegiate aviation students overall believe female representation is an important issue in aviation that needs to be addressed

and gave specific examples of gender imbalance and problems women encounter in collegiate aviation and the aviation industry. The researchers believe further research is needed to define and resolve the exact problems and causes of low female representation to ensure a diverse future aviation workforce.

Recommendations for Future Research

Based on the findings, discussion, and conclusion of this study the authors offer the following recommendations. Since collegiate aviation is the general starting point for most aviation professionals in the industry, a further study is recommended of collegiate aviation students and/or collegiate aviation faculty to gain personal insights through interviews to help understand and explain the existence of the gender representation gap in the aviation industry beginning at the collegiate level. This study could be utilized to understand the potential origin of the gender representation gap. Identifying and fixing the origin could have a ripple effect into the industry. This identification could be beneficial to the aviation industry to aid in the creation of new standards and policies along with inclusionary efforts to close the gender representation gap to ensure a future diverse aviation workforce. Additionally, it is recommended that self-efficacy further be investigated in collegiate aviation students that remain in collegiate flight programs and those that discontinue their studies or change to a non-aviation related degree program. This recommendation is in response to retention rates in collegiate aviation programs and the "departure puzzle" discussed by Bjerke and Healy (2010) where more than 25% of students enrolled in collegiate flight programs leave after their first year. Collegiate aviation programs report a retention rate average of 50%. Addressing retention issues through the application of the SCCT has the potential to not only address the forecasted pilot shortage in the industry but also provide a potential methodology to capture a more heterogenous pilot group moving forward

through collegiate training. As previously stated, self-efficacy has proven to be a useful construct in determining resilience and retention of women and other minorities in other collegiate STEM programs (Bhatt et al., 2020; Carpi et al., 2017; da Silva Cardoso et al., 2013; Garriott et al., 2013; Lent et al., 2000; Mastekaasa, & Smeby, 2006; Soldner et al., 2012; Tellhed et al., 2017).

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