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**ASSESSMENT AND INTERVENTION STRATEGIES FOR TEST ANXIETY
IN AVIATION STUDENTS**

Teresa Ann Sloan and Dale R. Wilson

Abstract

Observations from faculty and anecdotal reports from students in the Aviation Department at Central Washington University (CWU) indicate that the pressures associated with stage checks, end-of course exams, and other performance thresholds required for training under Title 14 Code of Federal Regulations Part 141 (1978) appear to contribute to high levels of test anxiety (TA) and poor performance by some students. The purpose of this review is to identify assessments used for early recognition of at-risk students, review methods used to reduce test anxiety, and recommend appropriate actions for implementation of assessments and reduction strategies that can benefit aviation students attending CWU and other collegiate aviation programs engaged in professional pilot training.

Background

As part of its curriculum, the Department of Aviation at Central Washington University (CWU) offers pilot ground school courses, and the University's approved flight training contract operator conducts flight training, under Title 14 Code of Federal Regulations Part 141 (1978). Assessments are conducted in accordance with a Federal Aviation Administration (FAA) approved syllabus following a strict format. Required ground stage and end-of-course written examinations require a minimum score of 80% to pass the course, and failure to earn a minimum cumulative course score of 80% requires the student to disenroll from both the FAA approved ground and flight training. Stage and end-of-course exams are also conducted by the contract operator for the flight portion of training. Students are required to complete stage checks within a designated time frame. Students who do not meet satisfactory progress requirements, as outlined in a Standard Operating Procedures manual, may be terminated from the course of flight training. Reinstatement is at the discretion of the Review Board consisting of a quorum of Aviation faculty and the contract operator's Chief or Assistant Chief Flight Instructor.

Students who have met the Review Board often expressed that they experienced test anxiety (TA) during

both ground and flight examinations. Many were referred to the Student Health and Counseling Center (SHCC) for identification and treatment of TA. When asked if they would participate in a program to help reduce TA most have enthusiastically replied "yes."

The purpose of this literature review is to explore existing research on TA to assist in developing a plan of action to address early identification and mitigation of TA in students enrolled in collegiate aviation programs.

Method

A literature review was employed to review past research on TA. Methods of assessments and intervention strategies are discussed. Suggestions from the literature review are reviewed for possible implementation by collegiate aviation flight programs.

Literature Review

Test Anxiety Defined

The TA construct began in 1952 with a Yale University study conducted by S. B. Sarason and Mandler (1952). Since then researchers have studied and classified TA and offered treatment options, often with conflicting findings.

I. G. Sarason referred to TA as "a problem of intrusive thoughts that interfere with task-focused thinking" (1984, p. 929). TA was also defined as "an unpleasant feeling or

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emotional state that has both physiological and behavioral concomitants and that is experienced in formal testing or other evaluative situations" (Dusek, 1980, p. 88). Schwarzer defined test anxiety as "a situation-specific state or trait which refers to examinations" (1986, p. 5.) TA was further defined in terms of two classifications. The first classification divided TA into two dimensions: *debilitating TA*, which detracted from performance, and *facilitating TA*, which improved performance (Alpert & Haber, 1960). The second classification divided TA into two components: *worry* (cognitive) and *emotionality* (affective) (Morris, Davis, & Hutchings, 1981; Schwarzer, 1986).

Assessing for TA

There are several instruments for assessing TA. The Test Anxiety Inventory (TAI) was used in several of the studies included in the literature review. The TAI tests for both worry and emotionality in exam situations (Spielberger, 1980). The State-Trait Anxiety Inventory (STAI) differentiates between transitory state anxiety and the more pervasive trait anxiety (Spielberger, Gorsuch, & Lushene, 1970). The Achievement Anxiety Test (AAT) measures the two dimensions of TA (Alpert & Haber, 1960). The Reactions to Tests questionnaire is used to assess dimensions of reactions to tests and is useful in identifying TA (Sarason, I. G., 1984).

Test Anxiety Models

Two primary theories are offered to explain the relationship between TA and test performance. The *interference* model of TA explains poor test performance as a result of TA interfering with the ability to recall prior learning during a test. The *deficit* model of TA proposes that TA is the result of past poor performance and not its cause.

Interference model.

I. G. Sarason (1984), Elliot and McGregor (1999), and Cassady (2001) stated that the worry (cognitive) component of TA was responsible for the deleterious effects on performance due to cognitive interference. Cognitive interference was defined as "intrusive thoughts that keep the individual from directing full attention to the task at hand" (Sarason, I. G., 1984, p. 932), and it included preoccupation with failure, non-task related thoughts during both exams and study sessions, obsessing about how well others are doing on the exam, and concern about what the examiner thinks of them (Cassady, 2001; Sarason, I. G., 1984).

Watson (1988) discussed the dual aspect of TA in terms of either debilitating or facilitating performance. Watson stated that high TA was associated with *debilitating TA* which reduced performance, and low TA was associated with *facilitating TA* which increased performance. Watson's

study concluded that those with debilitating TA still experienced reduced performance on tests even when steps were taken to remove anxiety through the use of individualized instruction.

Elliot and Church (1997) studied the effects of TA on the attainment of goals. Achievement goals were defined as the reason for task involvement. Elliot (1997) and Elliot and Church (1997) related achievement goals in terms of both recent and historic concepts and reclassified them into three achievement orientations: *mastery goals*, *performance-approach goals*, and *performance-avoidance goals*. Mastery goals are typified by a focus on achievement of competence and task mastery. Performance-approach goals are typified by a desire to be judged as competent relative to others, while performance-avoidance goals are typified by a desire to not be viewed by one's self as incompetent when compared to others (Elliot & McGregor, 1999). Mastery and performance-approach goals are deemed to create positive thought processes resulting in successful outcomes; performance-avoidance goals are considered to elicit negative thought processes, causing cognitive interference and a negative impact on performance (Elliot & McGregor, 1999).

Elliot and McGregor found no link between poor performance and the second component of TA, emotionality (1999). They concluded that the relationship between performance-approach goals and performance was unaffected by the *affective* (emotional) component of TA, but that the *cognitive* (worry) component of TA accounted for the debilitating relationship between performance-avoidance goals and performance attainment.

Deficit model.

Bandura and Locke (2003) discussed how perceived self-efficacy from past experiences could influence future performance. They stated that negative self-efficacy created by previous poor performance resulted in TA which impacted future performance. Their findings were supported by Brewer (2002) who stated that students who perform poorly or below their expected performance on the first examinations tended to experience increased anxiety on later exams.

Dendato and Diener (1986) stated that TA, rather than being the cause of poor performance, is a by-product of inadequate study skills which results in low test performance. Culler and Holahan (1980) found that "at least part of the academic performance decrement (of high test-anxious students) may be due to less knowledge of the relevant material as a function of differential study skills" (p. 18). Brown and Nelson (1983) stated that "academic skill

measures reflecting knowledge of effective study organization, reading behavior, and examination preparation skills as well as participants' self-rated study and test-taking skills seemed to be more strongly associated with academic performance than with test anxiety" (p. 372).

Research conducted by Bouffard-Bouchard (1990) found that test subjects tended to perform according to their self-efficacy beliefs, even when those beliefs were manipulated by the researchers. Those who were told that their standing in relation to their peers was higher than the norm tended to set higher goals and performed better than those of equal cognitive ability who were told that their standing was below the norm.

Treatment for Test Anxiety

Dendato and Diener (1986) found that cognitive and behavior therapies tended to reduce self-reported anxiety but did not improve overall performance, and study-skills training alone did neither. They suggested a combined approach including behavioral therapy, cognitive therapy, and study-skills training to improve performance and reduce TA. Smith, Arnkoff, and Wright (1990) suggested that a comprehensive multimodal approach that included "not only cognitive-attentional and skills components but also social learning components" could increase skills and confidence (p. 320).

A study conducted by Crowley, Crowley, and Clodfelter (1986) was employed to determine "the efficacy of a single-day workshop model as compared to traditional treatment" in the treatment of TA (p. 84). One proposed benefit was the cost effectiveness of a single-day workshop. They utilized the AAT developed by Alpert and Haber (1960) to assess for TA. Volunteers with high scores on the debilitating scale of the AAT were placed in their TA treatment program. Subjects were divided into two treatment groups plus a control group. One treatment group participated in the one-day workshop, and the second treatment group participated in a six-session program. Each group was tested with the TAI (Spielberger, 1980) and the Wonderlic Personnel Test (WPT; Wonderlic, 1978) before treatment. Post-testing consisted of the AAT, the TAI, and the WPT. The study concluded that the single-day workshop was as effective in reducing TA as the six-session program (Crowley, et al.).

Dendato and Diener (1986) conducted a study to determine the benefits of combining study-skills training with relaxation training and cognitive therapy into a TA treatment program. They utilized the TAI (Spielberger, 1980) and the STAI (Spielberger, et al., 1970) to test for TA. They then measured the effects of three treatment plans:

cognitive therapy and deep muscle relaxation treatments; cognitive therapy and deep muscle relaxation treatments combined with study-skills training; and study-skills training alone. Their findings showed that the combined relaxation and cognitive therapy helped reduce anxiety but did not improve performance, and that study skills training alone neither reduced anxiety nor improved performance. They reported that only the combination of all three techniques was successful in both reducing anxiety and increasing performance.

Many universities and colleges have Web sites with suggestions for reducing TA and information for obtaining assistance. Wright State University (n.d.) includes the AAT test (Albert & Haber, 1960) on their Web site along with contact information for assistance with TA. The University of Alabama's counseling center website (n.d.) discusses the symptoms of test anxiety and encourages students to contact the counseling Center for more information. The Pennsylvania State University (2001), The George Washington University (n.d.), the University at Buffalo (n.d.), and Villanova University (n.d.) Web sites all have contact information for assistance. CWU's on-line Student Advising Handbook (n.d.) shows that the counseling center offers quarterly workshops for test anxiety, stress management, and self esteem.

Hembree (1988) conducted a meta-analysis of TA treatment. He found that unobtrusive classical music played during testing enhanced the scores of subjects with high TA; however, this had the opposite effect on students with low TA. Hembree's meta-analysis concluded that all behavioral treatments reduced TA. He found that study-skills training was not effective in reducing TA and that combining such treatment with other treatments was no more effective than the other treatments alone. Hembree stated that behavioral treatments and a combination of behavioral and cognitive treatments were both effective in reducing worry and increasing facilitating TA.

The ultimate goal of TA treatment is to reduce the *debilitating TA* that may cause an individual's knowledge and/or skills to be inaccurately assessed. Hembree's 1988 meta-analysis concluded that "the evidence supports an interference rather than a deficits model of test anxiety" (p.74), and that cognitive and combined cognitive-behavioral training methods were effective in both reducing TA and improving test performance. Study skills training combined with systematic desensitization (a form of behavioral training) improved test performance and increased grade point average (GPA) for subjects found to have high TA and low study skills. Finally, Hembree's

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findings showed that reduced TA, increased facilitating TA, increased test performance, and GPA improvement remained stable on post-treatment follow-up scores during a three- to 60-week retention period.

Discussion

Collegiate aviation flight programs are rife with conditions conducive to increasing all of the negative aspects of TA. FAA testing requirements are demanding. Airline internships and direct-hire agreements with cooperating airlines are based in part on GPA and training records, and competition for these opportunities is intense. Furthermore, once hired into the commercial aviation industry, pilots are faced with bi-annual FAA required flight testing. If students are not able to overcome the deleterious effects of TA their future careers are in jeopardy.

The literature review shows that students who suffer from debilitating TA often match the performance of their peers in non-testing situations. For these students, it appears that poor self-efficacy results from previous negative testing experiences exacerbating debilitating TA, leading to continued poor performance on tests. Therefore, early detection and treatment are critical to breaking this chain. The progression of TA research shows that no single treatment method was superior, and a combination approach of cognitive, behavioral, and study skills treatments had the greatest effectiveness. A single day workshop appeared to be as effective as sessions conducted over a longer period and is more apt to attract both participants and facilitators.

Recommendations

Aviation students who suffer from debilitating TA can be identified through the use of readily accessible assessments. Early identification and treatment of TA can reduce negative self-efficacy and debilitating TA. The University employing the present authors conducts quarterly workshops for TA, stress management, and self-esteem. As a follow-up to this study, the authors will conduct TA assessment testing specifically for aviation freshmen, sophomores, and transfer students at the beginning of fall quarter. Aviation faculty will work with the SHCC to design one-day aviation-specific TA workshops consisting of cognitive, behavioral, and study-skills training. Students identified as having debilitating TA will be offered the opportunity to participate in the TA workshop. Aviation faculty should also benefit from training on TA conducted by the SHCC.

It is recommended that collegiate aviation programs take advantage of TA research and implement programs designed to reduce the negative effects of debilitating TA. Assisting students in overcoming TA should help reduce their stress and negative self-efficacy and increase their performance. An ancillary benefit is the retention of students who might otherwise fail or drop out of an aviation program simply due to TA. Aviation safety depends on superior performance from well prepared pilots. Early identification and treatment of TA can enhance safety by helping students to realize their highest potential. →

Teresa Sloan, who holds the rank of professor, has been teaching in the Aviation Department at Central Washington University since 1998 where she serves as the Department's Chief Ground Instructor. She holds an M.S. in *Initial Teaching*, a B.A. in *Business*, and a B.S. in *Aerospace*. She is a Certified Flight Instructor with over 3,500 hours of flight and simulator dual given and also holds ATP certification. She also served as the chief pilot and company check airman for a bush air taxi operation in Cordova, Alaska where she flew both wheel and float-equipped aircraft. Professor Sloan has published several papers in refereed publications including the JAAER. She has witnessed the debilitating effects of test anxiety on many of her students, both in the air and during ground school training, and desires to assist them in any way she can.

Dale Wilson, who holds the rank of professor, has been teaching in the Aviation Department at Central Washington University since 1996. Prior to this, he taught for thirteen years at the Institute of Aviation at Trinity Western University in Canada, where as a Class 1 Flight Instructor he provided academic instruction and flight training to private, commercial, multi-engine, and flight instructor pilot candidates. He has over 3,600 flight hours, and holds Airline Transport Pilot certification in the United States and Canada as well as FAA-Certified Flight and Ground Instructor certificates. His formal education includes an M.S. in *Aviation Safety* and a B.A. in *Psychology*. He has published several articles in various aviation-related magazines and journals (including the JAAER) and presented papers at national and international conferences. Professor Wilson serves as a reviewer for the JAAER and the IJAAS. He has earned the "Master CFI" designation from the National Association of Flight Instructors (NAFI) since 1999.

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