Gender Differences in Fear of Failure amongst Engineering Students

Krista L. Nelson, Ph. D.
University of Arkansas at Monticello
Psychology Department
School of Social and Behavioral Sciences
UAM Box 3619
Monticello, AR 71656, USA.

Danielle N. Newman, M. S.

Janelle R. McDaniel, Ph. D.

Walter C. Buboltz

Louisiana Tech University
Department of Psychology and Behavioral Sciences
Ruston, LA 71272, USA.

Abstract

As interest in increasing the involvement of women in science and engineering grows, it is necessary to identify perceived barriers to success in the fields. The present study assessed the levels of fear of failure in male and female engineering students with the Performance Failure Appraisal Inventory (PFAI) and a demographic questionnaire at a mid-size southern university. Results indicated that females reported significantly higher fear of failure than their male counterparts. Females also demonstrated higher scores on the subscales Fears of Experiencing Shame and Embarrassment (FSE), Fears of Devaluing One's Self-Estimate (FDSE), and Fears of Having an Uncertain Future (FUF). As Fear of Failure may be related to self-efficacy and self-esteem, these fears may impact women in their career development and decisions.

Keywords: Engineering Education, Fear of Failure, Gender Differences

1. Introduction

The field of engineering has long been an area dominated by males (Robinson & McIlwee, 1989). In the United States, females represent only eleven percent of American engineers (Baker, Krause, Yaşar, Roberts, & Robinson-Kurpius, 2007). According to the National Science Foundation (2008), women in the United States are consistently awarded fewer undergraduate degrees in engineering, technology, and science fields than their male counterparts (Hill, 1997). The need to attract, retain, and increase diverse student populations, including women and minorities, in engineering, technological, mathematical, and scientific (STEM) fields has been deemed important by the Committee on Equal Opportunities in Science and Engineering (National Science Board, 2004; Werner & Denner, 2009). The topic of imbalance in gender representation is an important issue that merits further examination.

Many explanations for the imbalance of gender in the engineering field have been offered, such as misconceptions of employees and their working styles in science fields (Clarke & Teague, 1994; Gürer & Camp, 2002; Pollack, McCoy, Carberry, Hundigopal, & You, 2004), and the shortage of appropriate role models that can be utilized for mentoring young women (Clarke & Teague, 1994; Scragg & Smith, 1998; Dryburgh, 2000; Pollack et al., 2004). Evidence suggests that as early as the high school years, females may have perceptions of the engineering field being unobtainable. In a study of Greek high school students, young women reported lower levels of self-efficacy than males regarding their abilities in engineering skills (Papastergiou, 2008) in combination with the belief that the self does not measure up to societal standards, particularly in regard to gender roles.

A young woman's self-efficacy and self-confidence may influence the decision to pursue an education in the science, math or technological fields. During the 20th and 21st centuries, the models of fear of failure and achievement motivation became popular areas of study (Conroy, Metzler, & Hofer, 2003). Many individuals in society suffered from fear of failing due to the importance placed upon success in their educational goals and careers (Shaver, 1976). In the 1950s and 1960s, psychological theory regarding fear of failure originated out of Atkinson's achievement motivation research and Need Achievement theory (Atkinson, 1957; 1964). Fear of failure was defined as an "avoidant motive which was aroused by debilitating anxiety" (Atkinson, 1957. p. 359) and may be divided into two separate and broad categories. The two categories are fears that relate to failing on an interpersonal level and those that pertain to failing in education goals or scholarly pursuits (Golden, 1988). The two categories are oftentimes related. For example, persons who fear failure in their place of employment may also fear failure in their personal lives (Golden, 1988).

Individuals who demonstrate fear of failure are unsure about their ability to be successful (Covington & Omelich, 1991), and do not believe in their capacity to avoid failure in their endeavors. Further, those who experience fear of failure often attach negative and painful consequences to the act or experience of failing at a given task or goal (Shultz, 1999). This results in a motive "to avoid situations where one may fail due to anticipatory shame and humiliation because the individual was fearful of failing" (Conroy, Kaye, & Fifer, 2007, p. 238). Conroy et al. (2003), define fear of failure as "a tendency to appraise threat and feel anxious during situations that involve the possibility of failing." (p. 239). As a result, these individuals often avoid or attempt to avoid situations where failure is a possibility (Conroy et al., 2003) and may opt to avoid goals in which failure is an option (Shultz, 1999). Such individuals are frequently depressed, anxious, confused, or angry; they also lack confidence, and may have low self-esteem or increased marital conflict (Sherman, 1988). Failure can be a threat to persons that associate failing with aversive consequences. In past research, failure that was linked to higher-order general fear of failure was comprised of five specific consequences (a) experiencing shame and embarrassment experiences, (b) devaluing one's self-estimate, (c) having an uncertain future, (d) losing social influence, and (e) upsetting important others (Conroy, Willow, & Metzler, 2002; Conroy et al., 2003; Conroy et al., 2007). Further, Conroy et al. (2007) reports individuals that believe that aversive consequences will occur after failure are typically more likely to feel threatened during evaluative situations.

Theories regarding the development of fear of failure have identified the experience of shame as being a significant contributor (McGregor, 2003). Shame behaviors are avoidant (McGregor, 2003) and can be considered as the negative censure that we feel for our own self (Lazarus, 1991). Self-reproach occurs when the self is evaluated and falls short of the desired standards against which the self was evaluated (Lewis, 1992). Lack of success can create shameful feelings of incompetence and negative emotions (McGregor, 2003). Past research has suggested that the origin of childhood shame regarding failure stems from parental reactions to failure behaviors (McGregor, 2003; Andrews, 1998). Fear of failure has been directly correlated with lack of self-confidence, poor feelings of self-esteem, and low risk-taking (Sherman, 1988; Elliot & Sheldon, 1997; Martin, 1998). It has often been examined in vocational or educational arenas. Research by Sherman (1988) has additionally demonstrated a link between fear of failure and sex-roles. For example, women fear that their success will create problems in their interpersonal relationships, particularly if they are going against societal norms of sex or gender acceptable roles.

Further, females often underestimate their mathematical and spatial perception skills due to lack of confidence. This lack of confidence that was related back to sex roles contributes to women's fear of failure in math and math-related areas (Sherman, 1988). Research has identified several consequences and implications of fear of failure including health concerns (Fox, 1994) reduced academic performance (Elliot & Sheldon, 1997; Elliot & Church, 1997) and self-esteem decline, feeling less in control of their personal life, and feeling less satisfied with life (Elliot & Sheldon, 1997). Past research has also examined the fear of success, specifically in women (Sherman, 1988; Depner & O'Leary, 1976; Golden, 1988). Fearing failure has been associated with a decrease in goal attainment and enjoyment of chores or duties, as well as an increase in avoiding tasks (Conroy, 2001). Being avoidant towards goal attainment has been associated with several outcomes. These include lowered satisfaction in academics and a decrease in self-esteem and satisfaction about life (Elliot & Sheldon, 1997). A decrease in academic achievement was also a noteworthy outcome of fearing failure (Elliot & Church, 1997).   Some individuals that experience fear of failure become motivated to practice and/or study harder to avoid failure; however, these individuals often experience higher levels of anxiety, which can be debilitating.

This anxiety can actually prevent some individuals from attaining their maximum potential to achieve academic, career, or personal goals (Conroy et al., 2003). Horner (1968) demonstrated that females with more conventional gender roles repeatedly expected to experience rejection in their social environments if they competed within an area that was perceived to be a traditionally masculine field. Similarly, males who engaged in more traditionally feminine careers or activities experienced similar anxiety regarding societal perception. Fear of failure in females has been argued as being an attribute to the aforementioned traditional sex roles while low self-esteem and low self-confidence have been determined as contributing factors for fear of failure (Sherman, 1988). Research has determined that those persons with higher feelings of self-confidence and feelings of personal value develop and utilize more adaptive coping skills. These individuals are more likely to create alternatives when success was not initially attained. Further, these individuals tend to be more successful academically, demonstrate more persistence, exhibit more effort, and use better coping skills when faced with difficult situations (Sherman, 1988). Conversely, individuals with low self-confidence or feelings of self-worth often dwell on their perception of personal failures. These individuals have a tendency to ruminate over their own perceived deficiencies and have a more fatalistic and negative life view than those persons with higher feelings of self-belief (Martin, 2002). Extensive research has linked self-belief to accomplishment, monitoring of self, determination, and effort (Martin, 2002; Martin & Debus, 1998; Schunk, 1990; Marsh, 1990; Skinner, Wellborn, & Connell, 1990; Pintrick & Blumenfeld, 1985).

The current study was conducted to determine if the overall fear of failure was significantly different between male and female engineering students. The Performance Failure Appraisal Inventory (PFAI) was used to measure fear of failure on a multidimensional level (Conroy, 2001; Conroy et al., 2002; Conroy et al., 2003) of fears of shame and embarrassment, beliefs about personal skills and abilities, fears about the future, concern about loss of interest by loved ones, and fears that loved ones would be angry or upset among engineering students. It was hypothesized that female engineering students would demonstrate significantly higher fear of failure than male engineering students

2. Method

2.1 Participants

Participants were student volunteers enrolled in undergraduate engineering classes at a mid-size southern university. From an initial sample of 250 participants, data were retained for analysis from the 220 participants who fully completed the survey. Of the 220 participants, there were 158 males and 62 females. The age of participants ranged from 17 to 38 years old (M = 20.75, SD = 3.64). The ethnicity of the sample was of 167 Caucasians (75.9%), 28 African-Americans (12.7%), seven Asian-Americans (3.2%), four Latino/Latina Americans (1.8%), two Native American (0.9%), and 11 Others (5%) who did not include their ethnic backgrounds. One participant (0.5%) did not include any response to the ethnicity question.

2.1.1 Male Participants. The male participants comprised 71.8 percent of the research sample. Male participants ranged in age from 17 to 38 years old (M = 21.07, SD = 3.83). For the males, 124 were Caucasian (78.5%), 20 were African-Americans (12.7%), four were Asian-American (2.5%), two were Native Americans (1.3%), one was Latino (0.6%), and six identified as Other (3.8%). One male did not indicate his ethnicity (0.6%). The male participants included 48 freshman (30.4%), 29 sophomores (18.3%), 39 juniors (24.7%), 39 seniors (24.7%), and three who did not answer the question (1.9%).

2.1.2 Female Participants. The female participants ranged in age from 18 years to 26 years old (M = 20.25, SD = 1.85). There were 43 Caucasian participants (69.4%) who comprised the majority of the female sample. The other ethnicities identified were eight African-Americans (12.9%), three Asian-Americans (4.8%), three Latinas (4.8%), and five who identified as Other (8.1%). The female participants included 17 freshmen (27.4%), 18 sophomores (29%), ten juniors (16.2%), and 17 seniors (27.4%).

2.2 Materials

2.2.1 Demographic questionnaire. The demographic questionnaire consisted of seven items designed to gather data on standard demographic information of the participants. The demographic questionnaire included questions such as current age, sex/gender, ethnicity/race, and current educational level. Additionally, the grade point average (GPA) was asked of each participant. The demographic questionnaire also asked questions regarding sexual orientation and current relationship status to gather data for the present study.

12

2.2.2 Performance failure appraisal inventory. The Performance Failure Appraisal Inventory (PFAI; Conroy, 2001; Conroy et al., 2002) is a 25-item multidimensional measure of cognitive-emotional-relational appraisals associated with fear of failure (Conroy et al., 2002). The PFAI identifies five aversive consequences that are associated with fear of failing: Fears of Experiencing Shame and Embarrassment (FSE), Fears of Devaluing One's Self-Estimate (FDSE), Fears of Having an Uncertain Future (FUF), and Fears of Important Others Losing Interest (FIOLI), and Fears of Upsetting Important Others (FUIO) (Conroy et al., 2007; Conroy, 2001). Responses for the PFAI are on a five-point Likert-type scale ranging from do not believe at all (-2) to believe 100% of the time (+2). Each item on the PFAI begins with either of two question stems, "When I am failing" or "When I am not succeeding", which is followed by a perceived failure consequence that is potentially aversive to the individual (Conroy et al., 2003). To rescale items from one to five required a constant of plus three to be added to the responses. Responses averaged for items on individual scales allowed for the scaled scored to be calculated, with one question reversed for scoring on the FUF scale (Conroy et al., 2003).

2.3 Procedure

The researcher provided the research questionnaires to those student participants in each classroom that choose to participate in the study. Participants were informed that individual responses would be collectively reported in a group format. Each participant was asked to answer the PFAI and demographics survey. The participants were then asked to return with their completed questionnaire at the next class session. The primary researcher was present at the next class session to retrieve the completed questionnaires from the student volunteers.

3. Results

Fear of failure was analyzed using multivariate analysis of variance (MANOVA) on data from the Performance Failure Appraisal Inventory. Results indicated significant gender differences in the fear of failure variable, $F(5, 207) = 6.40$, $p < .05$; Wilk's $\lambda = 0.87$. ANOVA was used to analyze each subscale of the Performance Failure Appraisal Inventory. The sum of squares, mean squares, degrees of freedom, and F ratios for ANOVA can be seen in Table 1.

Results of the ANOVA indicated that female engineering students were significantly more likely to experience shame and embarrassment in front of others ($F(1, 214) = 10.67$, $p < .05$), exhibited lower beliefs regarding their skills and abilities ($F(1, 215) = 23.44$, $p < .05$), and had more fears regarding their future ($F(1, 215) = 7.34$, $p < .05$), than their male counterparts. Female students did not report more concern that important loved ones in their life have lost interest in them ($F(1, 214) = 0.04$, $p = .85$, ns) or greater fear that significant others would be angry or upset at them ($F(1, 213) = 0.14$, $p = .71$, ns,) than their male counterparts.

4. Discussion

The present study aimed to determine gender differences regarding fear of failure amongst engineering students. Results indicated that female engineering students would likely suffer more feelings of humiliation and discomfort when others witness their personal failures, and they are more likely to feel that other individuals are aware of their personal failure experience. In addition, female engineering students may be more likely to believe that if they fail, then the doubt expressed by others regarding their performance about their abilities and competence was correct. This may increase the worry female engineering students have about what other individuals think about them if they demonstrate failure behaviors.

Often, students will avoid failure in academics or other educational settings to prevent shame from failure (Elliot & Thrash, 2002). Students that experience elevated fear of failure may attempt to establish objectives or aspirations that are geared towards avoiding tasks that may demonstrate their incompetence and will utilize those goals that avoid mastery or performance (Bartels & Magun-Jackson, 2009; Conroy, 2004; Conroy & Elliot, 2004; Thrash & Elliot, 2002; Elliot & McGregor, 1999; Elliot & Church, 1997; Elliot & Sheldon, 1997). Fear of failure can be identified as being negatively related with cognitive strategy adaptation (Bartels & Magun-Jackson, 2009). Researchers have also determined that fear of failure and fear of success is actually two similar components of one motive (Jackaway & Teevan, 1976). Specifically, researchers argue that many similarities in the theories and definitions exist between the two motives. Additionally, there was overlap in how these two motives were measured in scoring systems of assessments. The underlying factor between fear of failure and fear of success was hypothesized as being fear of social rejection. This finding was found to be significantly higher in women than in men.

Achievement and affiliation needs were also more closely related in females than males (Jackaway & Teevan, 1976). Measuring the level of anxiety for fear of failure and fear of success in women may be measuring the same source of anxiety in certain circumstances. Research has found that females have reacted negatively to accomplishments and achievements that conflict with more traditional gender roles (Depner & O'Leary, 1976). Women often experience fear as a result of going against traditional gender roles (Sherman, 1988). Studies have concluded that when viewing fear of success and fear of failing individually, researchers must account for sex role differences and the individual's life situation to determine whether the fear of success may be demonstrated as fear of failure in another aspect of the person's life (Sherman, 1988). Researchers determined that going against traditional sex roles can create internal conflict for women because of the internalized belief that they are not conforming to traditional feminine behaviors (Golden, 1988; Sherman, 1988; Shaver, 1976).

Our findings also indicated female engineering students may be less likely than males to value their own skills and abilities, which may impact self-efficacy. Female engineering students are more likely to experience fear that they are not in control of the outcome of their performance because of their internalized self-devaluation. Previous studies indicated that females are susceptible to feelings of low self-esteem and low self-worth regarding their personal abilities and skills, which influence their feelings regarding a career in engineering or other science and math fields (American Association of University Women, 2008; Papastergiou, 2008; Dawes, Horan, & Hackett, 2000; Hyde, Fennema, & Ryan, 1990). Past studies have also identified that having feelings of low self-efficacy were significantly related to fearing failure or being unsuccessful in the field of engineering (Sherman, 1988; Elliot & Sheldon, 1997; Martin, 2002). This augments Sherman's (1988) findings that fear of failure is significantly related to having feelings of low self-esteem and low self-worth. The current study indicated females are more susceptible to experiencing fears of not being valued within the field of engineering. These fears are likely related to their personal feelings of self-worth and self-esteem, and indicate females are more likely to worry about how others view their individual performance. Role models have been suggested as a means to increase feelings of self-worth and reduce fears of failing (Smith, 2005).

Fears that their future will be uncertain or will change as a result of their personal failure were significantly higher for female engineering students in this study. Females who experience this fear also are likely to experience fear that failing will be instrumental in upsetting their future plans, and they will have to renegotiate their goals for the future. Because female engineering students may fear they are viewed less favorably as potential engineers, they may internalize this fear into concern about their success in the future, potential for advancement, and potential earnings as an engineer.

In the present study, female engineering students did not experience significantly higher levels of fear that significant others will become uninterested than their male counterparts. It is possible that female engineering students are less concerned about having significant relationships at the present time because of the rigors and demands of seeking an engineering degree. Also, female engineering students did not exhibit significantly higher fears that their important loved ones would become displeased, disappointed, or enraged than their male counterparts. The reason for this lack of fear could be that female engineering students feel secure in their relationships and believe their significant others to be supportive of their decision to be engineer.

The current study was conducted with male and female engineering students at a single mid-sized southern university. There may be significantly different attitudes across locations and university size. It would be beneficial to have studies done at varying locations. The majority of the sample was male (71.8%) which may have affected the analysis. Although engineering is a male-dominated field, it would be useful for future research to include more female participants in their study. Also, a large majority of our sample was Caucasian (75.9%). Future studies may want to focus on a more diverse sample of students in order to assess if differences in ethnicity are also playing a part in the fear of failure in addition to gender.

It would also be interesting to assess the fear of failure in males and females currently employed in the field of engineering to compare fear of failure while pursuing an education in engineering and after entering the workforce. Females may not experience significantly different results regarding fear of failure after they have completed school and have a job within the field. It remains important to investigate fear of failure and related constructs such as self-efficacy and self-esteem in this population.

References

American Association of University Women (2008). Women and girls in STEM. Washington, DC: American Association of University Women.

Andrews, B. (1998). Shame and childhood abuse. In P. Gilbert & B. Andrews (Eds.), Shame: Interpersonal behavior, psychopathology and culture series in affective science (pp. 176-190). New York, NY: Oxford University Press.

Atkinson, J. W. (1957). Motivational determinants of risk-taking behavior. Psychological Review, 64, 359-372.

Atkinson, J. W. (1964). An introduction to motivation. Princeton, NJ: Van Nostrand.

Baker, D., Krause, S., Yaşar, Ş., Roberts, C., & Robinson-Kurpius S. (2007). An intervention to address gender issues in a course on design, engineering, and technology for science educators. Journal of Engineering Education, 96, 213-226.

Bartels, J. M., & Magun-Jackson, S. (2009). Approach-avoidance motivation and metacognitive self-regulation: The role of need for achievement and fear of failure. Learning and Individual Differences, 19, 459-463.

Clarke, V. A., & Teague, G. J. (1994). A psychological perspective on gender differences in computing participation. ACM SIGSCE Bulletin, 26, 258-262.

Conroy, D. E. (2001). Progress in the development of a multidimensional measure of fear of failure: The performance failure appraisal inventory (PFAI). Anxiety, Stress and Coping, 14, 431-452.

Conroy, D. E. (2004). The unique psychological meanings of multidimensional fears of failing. Journal of Sports & Exercise Psychology, 26, 484-491.

Conroy, D. E. & Elliot, A. J. (2004). fear of failure and achievement goals in sport: Addressing the issue of the chicken and the egg. Anxiety, Stress, and Coping, 17, 271–285.

Conroy, D. E., Kaye, M. P., & Fifer, A. M. (2007). Cognitive links between fear of failure and perfectionism. Journal of Rational-Emotive & Cognitive-Behavior Therapy, 25, 237-253.

Conroy, D. E., Metzler, J. N., & Hofer, S. M. (2003). Factorial invariance and latent mean stability of performance failure appraisal inventory. Structural equation modeling, 10, 401-422.

Conroy, D. E., Willow, J. P., & Metzler, J. N. (2002). Multidimensional fear of failure measurement: The performance failure appraisal inventory. Journal of Applied Sports Psychology, 14, 76-90.

Covington, M.V., & Omelich, C.E. (1991). Need achievement revisited: Verification of Atkinson's original 2x2 model. In C. D. Speilberger, I.G., Sarason, Z. Kulesar & G.L. Heek (Eds.). Stress and emotion: anxiety, anger, curiosity. (pp. 85-105). New York: Hemisphere.

Dawes, M. E., Horan, J. J., & Hackett, G. (2000). Experimental evaluation of self efficacy treatment on technical/scientific career outcomes. British Journal of Guidance & Counseling, 28, 87-99.

Depner, C. E., & O'Leary, V. E. (1976). Understanding female careerism fear of success and new directions. Sex Roles, 2, 259-268.

Dryburgh, H. (2000). Underrepresentation of girls and women in computer science: Classification of 1990s research. Journal of Educational Computing Research, 23,181-202.

Elliot, A. J., & Church, M. A. (1997). A hierarchical model of approach and avoidance achievement motivation. Journal of Personality and Social Psychology, 72, 218-232.

Elliot, A.J. & McGregor, H.A. (1999). Test anxiety and the hierarchical model of approach and avoidance achievement motivation. Journal of Personality and Social Psychology, 76, 628-644.

Elliot, A. J., & Sheldon, K. M. (1997). Avoidance achievement motivation: A personal goals analysis. Journal of Personality and Social Psychology, 73, 171-185.

Elliot, A. J., & Thrash, T. M. (2002). Approach-avoidance motivation in personality: Approach and avoidance temperaments and goals. Journal of Personality & Social Psychology, 82, 804–818.

Fox, A. (1994). The fear of failure the risk of failure. Health Confidential, 8, 13-14.

Golden, C. (1988). I know this is stupid, but…: Or, some thoughts on why female students fear failure and not success. Women & Therapy, 6, 41-49.

Gürer, D., & Camp, T. (2002). An ACM-W literature review on women in computing. ACM SIGSCE Bulletin, 34, 121-127.

Hill, S. T. (1997). Science and engineering bachelor's degrees awarded to women increase overall, but decline in several fields. National Science Foundation, NSF 97-326, Retrieved September 23, 2009 from http://www.nsf.gov/statistics/databrf/sdb97326.htm

Horner, M. S. (1968). Sex differences in achievement motivation and performance in competitive and non-competitive situations. Unpublished doctoral dissertation, University of Michigan.

Hyde, J. S., Fennema, E., & Ryan, M. (1990). Gender comparisons of mathematics attitudes and affect: A meta-analysis. Psychology of Women Quarterly, 14, 299-324.

Jackaway, R., & Teevan, R. (1976). fear of failure and fear of success two dimensions of the same motive. Sex Roles, 2, 283-293.

Lazarus, (1991). Emotion and adaptation. New York, NY: Oxford University Press.

Lewis, M. (1992). Shame: The exposed self. New York, NY: The Free Press.

Marsh, H. W. (1990). A multidimensional, hierarchical model of self-concept: Theoretical and empirical justification. Educational Psychology Review, 2, 77-172.

Martin, A. J. (1998). Self-handicapping and defensive mechanisms: Predictors and Consequences from a self-worth motivation perspective. Unpublished doctoral dissertation. University of Western Sydney, Macarthur.

Martin, A. J. (2002). The lethal cocktail: Low self-belief, low control, and high fear of failure. Australian Journal of Guidance & Counseling, 12, 74-85.

Martin, A. J., & Debus, R. L. (1998). Self-reports of mathematics self-concept and educational outcomes: The roles of ego-dimensions and self-consciousness. British Journal of Educational Psychology, 68, 517-535.

McGregor, H.A. (2003). The shame of failure: Exploring the relationship between fear of failure and shame. (Doctoral dissertation, University of Rochester, 2003). Dissertation Abstracts International, 64, 1942.

National Science Board (2004). Science and engineering indicators 2004, Volume 2.
    Arlington, VA: National Science Foundation Publications.

National Science Foundation. (2008). Women, minorities, and persons with disabilities in science and engineering. Division of Science Resources Statistics, National Center for Education Statistics, Retrieved September 23, 2009 from http://www.nsf.gov/statistics/wmpd/pdf/tabc-12.pdf

Papastergiou, M. (2008). Are Computer Science and Information Technology still masculine fields? High school students' perceptions and career choices. Computers & Education, 51, 594-608.

Pintrich, P. R., & Blumenfeld, P. C. (1985). Classroom experience and children's self- perceptions of ability, effort, and conduct. Journal of Educational Psychology, 77,646-657.

Pollack, L., McCoy, K., Carberry, S., Hundigopal, N., & You, X. (2004). Increasing high school girls' self confidence and awareness of CS through a positive summer experience. ACM SIGCSE, 36, 185-189.

Robinson, J. G., & McIlwee, J. S. (1989). Women in engineering: A promise unfulfilled? Social Problems, 36, 455-472.

Schunk, D. H. (1990). Introduction to the special section on motivation and efficacy. Journal of Educational Psychology, 82, 3-6.

Scragg, G., & Smith, J. (1998). A study of barriers to women in undergraduate computer science. ACM SIGSCE Bulletin, 30, 82-86.

Shaver, P. (1976). Questions concerning fear of success and its conceptual relatives. Sex Roles, 2, 305-320.

Sherman, J. A. (1988). Achievement related fears: Gender roles and individual dynamics. Women & Therapy, 6, 97-105.

Shultz, T. (1999). Behavioral tendencies of high fear of failure individuals in variable situational conditions. (Doctoral dissertation, The City University of New York, 1999). Retrieved from UMI. (UMI Number: 9917698).

Skinner, E. A., Wellborn, J. G., & Connell, J. P. (1990). What it takes to do well in school and whether I've got it: A process model of perceived control and children's engagement and achievement in school. Journal of Educational Psychology, 82, 22-32.

Smith, J. D. N. (2005). Understanding the beliefs, concerns and priorities of trainee teachers: A multi-disciplinary approach. Mentoring & Tutoring: Partnership in Learning, 13, 205-219.

Thrash, T. M., & Elliot, A. J. (2002). Implicit and self-attributed achievement motives: Concordance and predictive validity. Journal of Personality, 70, 729-755.

Werner, L., & Denner, J. (2009). Pair programming in middle school: What does it look like? Journal of Research on Technology in Education, 42, 29-49.

Table 1: Analysis of Variance (ANOVA) for Fear of Failure Hypotheses in Study One Performance Failure Appraisal Inventory

Variable	*F*	*df*	*Sum of Squares*	*Mean Squares*	*p*
FSE	10.67	(1, 214)	326.99	326.99	.001
FDSE	23.44	(1, 215)	293.46	293.46	.000
FUF	7.34	(1, 215)	110.65	110.65	.007
FIOLI	0.04	(1,214)	0.79	0.79	.850
FUIO	0.14	(1, 213)	3.34	3.34	.708

Note: F = F ratio of ANOVA; df = degrees of freedom; p = probability; FSE = Fears of Experiences Shame and Embarrassment; FDSE = Fears of Devaluing One's Self Estimate; FUF = Fears of Having an Uncertain Future; FIOLI = Fears of Important Others Losing Interest; FUIO = Fears of Upsetting Important Others