PERGAMON

Personality and Individual Differences 33 (2002) 239–251

PERSONALITY AND INDIVIDUAL DIFFERENCES

www.elsevier.com/locate/paid

# Individual differences in statistics anxiety: the roles of perfectionism, procrastination and trait anxiety

James J. Walsh*, Godwin Ugumba-Agwunobi

*Department of Psychology, University of East London, Romford Road, London E15 4LZ, UK*

Received 20 February 2001; received in revised form 31 July 2001; accepted 13 August 2002

**Abstract**

Recent research detected small but significant associations between perfectionism and statistics anxiety [Onwuegbuzie, A., & Daley, C. (1999). Perfectionism and statistics anxiety. *Personality and Individual Differences*, *26*, 1089–1102]. The current study re-examined this relationship whilst simultaneously controlling for trait anxiety and procrastination, variables which are known to be associated with perfectionism and which also have a likely association with statistics anxiety. Measures of all four constructs were obtained by questionnaire from a sample of 93 students, and multiple regression analyses were employed. Statistics anxiety constituted the criterion variable whilst perfectionism, trait anxiety and procrastination were regarded as predictor variables. Results indicated very modest links between inter-personal perfectionism and components of statistics anxiety, whereas intra-personal perfectionism, trait anxiety and procrastination were each found to have good predictive utility. It was concluded that aspects of ego-involvement such as fear of failure and evaluation concern, which are thought to pervade each of these predictors, may be responsible for statistics anxiety. 

*Keywords:* Perfectionism; Procrastination; Statistics anxiety; Trait anxiety

## 1. Introduction

Increased research attention to individual differences in perfectionism over the past two decades has brought with it a proliferation of definitions and conceptualisations of the construct. For example, Hamachek (1978) distinguished between normal and neurotic perfectionism, Norman, Davies, and Nicholson (1998) differentiated between adaptive and maladaptive perfectionism, Terry-Short, Owens, Slade, and Dewey (1995) discriminated positive from negative perfectionism,

* Corresponding author. Tel.: +44-20-8223-4966; fax: +44-20-8223-4937.
*E-mail address:* J.J.Walsh@uel.ac.uk (J.J. Walsh).

0191-8869/02/$ - see front matter 
PII: S0191-8869(01)00148-9

and Adkins and Parker (1996) separated active from passive perfectionism. As well as the traditionally negative emphasis, these two-dimensional characterisations implicitly acknowledged positive aspects of perfectionism, in particular achievement-striving and self-actualisation (Frost, Marten, Lahart, & Rosenblate, 1990).

Multidimensional conceptualisations of perfectionism have also emerged in the last few years. For example, Hewitt and Flett (1991) identified three types of neurotic perfectionism—self-oriented, other-oriented, and socially prescribed. Self-oriented perfectionism involves setting unrealistic goals for oneself, stringently evaluating oneself against their attainment, selectively attending to failure and over-generalising it, and engaging in all-or-nothing thinking. Other-oriented perfectionism is similar except that it is directed towards others; that is, the efforts of others are stringently evaluated against unrealistic standards. Finally, socially prescribed perfectionism defines a set of beliefs people have that others expect perfection from them, hold unrealistic standards for them, and will evaluate them stringently. An alternative, multidimensional, model has been offered by Frost et al. (1990). They identified six components which, when combined, provide a total perfectionism score. The most important components are those related to the setting of high standards and excessive concern over mistakes. Frost, Heimberg, Holt, Mattia, and Neubauer (1993) compared their own measure of perfectionism with that of Hewitt and Flett (1991) and found considerable overlap. A factor analysis of all nine sub-scales yielded a two-factor solution, the first reflecting maladaptive evaluation concerns and the second positive achievement striving. It seems that however one chooses to conceptualise perfectionism, setting unrealistic goals and negatively evaluating the self in response to inevitable failure are central to the construct.

One reason why the study of perfectionism has become increasingly popular may be attributable to its consistent links with a wide variety of psychological disturbances and distress. For example, neurotic perfectionism has been linked with anorexia nervosa (Cooper, Cooper, and Fairburn, 1985), depression (Blatt, 1995; Hewitt, & Dyck, 1986), suicide ideation (Baumeister, 1990; Hewitt, Newton, Flett & Callander, 1997); alcoholism (Hoge & McCarthy, 1983) and depressive affect (Higgins, Bond, Klein, & Strauman, 1986). More recent work has found links between self-oriented perfectionism and burnout in competitive junior tennis players (Gould, Tuffey, Udry, & Loehr, 1997), and between Hewitt and Flett's (1991) three components of perfectionism and cynicism and exhaustion among career mothers (Mitchelson & Burns, 1998). In addition, perfectionism has been linked with procrastination among students (Solomon & Rothblum, 1984), and with depression and anxiety among those striving for academic achievement.

Of particular interest to the current study is the association between perfectionism and anxiety. Antony, Purdon, Huta, and Swinson (1998) found higher levels of socially prescribed perfectionism among anxiety patients (panic disorder, obsessive compulsive disorder and social phobia) than among non-clinical controls. Likewise, in a non-clinical student sample, Saboonchi and Lundh (1997) reported positive associations between expressions of social anxiety and socially prescribed perfectionism. Sullivan, Bulik, Fear, and Pickering (1998) also reported higher anxiety in socially prescribed perfectionists.

The mechanisms which mediate the relationship between perfectionism and these various pathological outcomes are not well understood. A stress-diathesis model was put forward and tested by Hewitt, Flett, and Ediger (1996). They found that perfectionism was predictive of

depression over time, but only if stressful conditions prevailed. According to Hewitt and Flett (in press), perfectionism influences the aversiveness and duration of stress, and may be responsible for generating it in the first instance. For example, when encountering an ego-involving failure experience, perfectionists experience distress more intensely than non-perfectionists. This is because their sense of self-worth is equated with perfect performance (Pacht, 1984), because they tend to over-generalise failure, and because they engage in negative ruminations about the self. Frost et al. (1997) reported higher levels of concern and negative affect over mistakes among perfectionists than non-perfectionists. Because of their self-imposed excessively high standards, no performance can ever be seen as satisfying. Constantly identifying episodes of failure may in itself be stress-generating.

At a sub-clinical level, perfectionism has also been associated with statistics anxiety (Onwuegbuzie & Daley, 1999). Statistics anxiety has been defined simply as anxiety that occurs as a result of encountering statistics in any form and at any level (Onwuegbuzie, DaRos, & Ryan, 1997), and has been found to negatively affect learning (Onwuegbuzie & Seaman, 1995). Because a basic grounding in statistics forms an important component of many different programs at university level, related anxiety can compromise a successful university experience and may result in academic under-achievement (Zeidner, 1991). Although research into statistics anxiety has been conducted for about twenty years now (e.g. Roberts & Saxe, 1982), Zimmer and Fuller (1996) could find no studies linking personality to statistics, with Onwuegbuzie and Daley's (1999) study apparently being the first to establish such a link. Like perfectionism, statistics anxiety also emerged as multidimensional. In particular, Cruise, Cash, and Bolton (1985) identified six components, namely worth of statistics, interpretation anxiety, test and class anxiety, computational self-concept, fear of asking for help, and fear of statistics teachers. Using Hewitt and Flett's (1991) three-dimensional model of perfectionism and Cruise et al's measure of statistics anxiety, Onwuegbuzie and Daley (1999) found that other-oriented and socially prescribed perfectionism positively predicted statistics anxiety in a graduate sample. Relationships were significant for interpretation anxiety, computational self-concept, and fear of asking for help. These findings are in keeping with the view that perfectionists are vulnerable when exposed to tasks that can illuminate failure.

In examining the limitations of their study, Onwuegbuzie and Daley suggested that, compared with perfectionism, other personality dimensions might play an important role in predicting statistics anxiety. The current study is designed to address this possibility. Two established personality factors, procrastination and trait anxiety, will be examined.

The reason for including trait anxiety is fairly obvious given that those who score high on this dimension have a tendency to selectively attend to environmental threat (Eysenck, McLeod, & Mathews, 1987) and to preferentially interpret ambiguous stimuli in a threatening rather than non-threatening manner (Calvo, Eysenck, & Castillo, 1997). These cognitive biases are likely to result in trait anxious individuals experiencing more anxiety than non-anxious counterparts (Derakshan & Eysenck, 1997). In addition, there is direct empirical evidence supporting a link between perfectionism and trait anxiety (Flett, Hewitt, & Dyck, 1989). Accordingly, any examination of factors which predict statistics anxiety should, at the very least, include trait anxiety as a control variable.

Procrastination is another trait which has been found to be associated with perfectionism (Burka & Yuen, 1983; Flett, Hewitt, & Martin, 1995; Hamachek, 1978; Missildine, 1963; Pacht,

1984). It is defined as an irrational tendency to delay tasks that should be completed (Lay, 1986), and those exhibiting academic procrastination have reported problematic levels of anxiety (Rothblum, Solomon, & Murakami, 1986). It has been estimated that between 40% (Solomon & Rothblum, 1984) and 95% (Ellis & Knaus, 1977) of students engage in academic procrastination. Fear of failure has been suggested as one factor underlying procrastination (Flett, Hewitt, Blankstein, & Mosher, 1991; Rothblum, 1990), whilst Saddler and Buley (1999) have argued that concerns about negative evaluation underpin the construct. Such factors are also closely associated with perfectionism (Flett et al., 1995). Empirical evidence of a positive link between socially prescribed perfectionism and the magnitude and frequency of academic procrastination has been provided by Flett, Blankstein, Hewitt, and Koledin (1992). Given that procrastination is associated with high levels of anxiety, and with fear of failure and negative social evaluation, its similarity to and potential overlap with perfectionism is clear. Therefore, as in the case of trait anxiety, in order to obtain a complete and accurate account of the relationship between perfectionism and statistics anxiety it is necessary also to include a measure of procrastination in the study.

In sum, the purpose of the study was to assess the relationship between perfectionism and statistics anxiety in a manner similar to Onwuegbuzie and Daley (1999), but to include the additional dimensions of trait anxiety and procrastination in order to remove their effects from any such relationship.

## 2. Method

### 2.1. Participants

Ninety-three undergraduate students at a London university who were currently enrolled on, or had recently completed, a statistics/research methods course were recruited. The sample included both social science and behavioural science students, and contained 66 females (71%) and 27 males (29%). Ages ranged from 18 to 39 years, the mean being 23.3 (S.D. = 5.5) years.

### 2.2. Design and measures

A correlational, cross-sectional design was employed with perfectionism, procrastination and trait anxiety conceptualised as predictor variables, and statistics anxiety treated as a criterion variable.

#### 2.2.1. Perfectionism

Perfectionism was assessed via the Multidimensional Perfectionism Scale (MPS—Hewitt & Flett, 1991), a 45-item inventory designed to measure self-oriented, other-oriented and socially prescribed components. Participants indicated their level of agreement and disagreement with each item using a seven-point Likert response format ranging from strongly disagree to strongly agree. Each sub-scale was scored by summing responses to the relevant 15 items; thus, sub-scale scores could range from 15 to 105, with higher scores indicating higher levels of perfectionism. The psychometric properties of the MPS are impressive. For example, the internal consistency of

the three sub-scales ranges from 0.82 to 0.87, with re-test reliability ranging from 0.75 to 0.88 over a 3-month period (Hewitt & Flett, 1991). The validity of each component was also demonstrated in a number of empirical studies (Hewitt & Flett, 1991). Furthermore, the scales appear to be unaffected by gender or social desirability responding, nor do they contain items that overlap with the measurement of anxiety.

#### 2.2.2. Trait anxiety

Trait anxiety was assessed using the trait version of the State/Trait Anxiety Inventory (STAI—Spielberger, Gorsuch, & Lushene, 1970). This is a 20-item measure of how anxious one generally feels. A four-point rating scale was employed, with respondents indicating how often they experienced each item (almost never to almost always). Potential scores could range from 20 to 80 with higher scores indicating higher trait anxiety. The validity and reliability of this measure is well-established (Spielberger, 1983).

#### 2.2.3. Procrastination

Procrastination was assessed using Aitken's Procrastination Inventory (API—Aitken, 1982). This comprises 19 statements which participants rate as true or false using a five-point scale. Potential scores could range from 19 to 95, with higher scores indicating higher levels of procrastination. The scale was designed for college students in the first instance, and evidence of its psychometric properties is reported by Ferrari, Johnson and McCown (1995). In particular, Aitken (1982) found an internal consistency coefficient of 0.82, whilst McCown and Ferrari (1995) reported a re-test reliability coefficient of 0.71. Aitken (1982) also reported evidence of validity in the form of correlations between procrastination and energy levels (−0.26) and anxiety (0.19). In addition, McCown, Petzel, and Rupert (1987) found that procrastinators, as measured by the API, underestimated the time taken to perform a reading task and preferred to complete simple over difficult task components.

#### 2.2.4. Statistics anxiety

This was measured using Cruise and Wilkins' (1980) Statistics Anxiety Rating Scale (STARS). The 51-items comprised six sub-scales, namely worth of statistics (16 items), interpretation anxiety (11 items), test and class anxiety (eight items), computational self-concept (perception of one's ability to do statistics—seven items), fear of asking for help (four items), and fear of statistics teacher (five items). Five-point Likert rating scales were employed throughout, in some cases anchored between no anxiety and very much anxiety, and in other cases between strongly agree and strongly disagree. Cruise et al. (1985) have reported reliability coefficients for the sub-scales ranging from 0.68 to 0.94. Five week re-test reliability ranged from 0.67 to 0.84, and evidence of face, criterion and construct validity was also reported.

### 2.3. Procedure

Students were approached during classes and invited to participate in the study by anonymously completing a questionnaire booklet containing the four measures described above as well as a short demographics measure (age, sex, etc.). Completed questionnaires were returned in prepaid envelopes to the researchers, otherwise to a box placed at the help desk in the Psychology

Department. Instructions were presented at the top of each separate measure indicating how it should be completed. To counteract possible order effects, the statistics anxiety questionnaire was completed either first or last in approximately half of the cases.

## 3. Results

The means and standard deviations for perfectionism, trait anxiety, procrastination and statistics anxiety were calculated and are presented in Table 1. Both self-oriented and socially prescribed perfectionism scores emerged just above the scale's arithmetic average ($M = 60$) whilst other-oriented perfectionism was just below it. Levels of trait anxiety proved to be slightly below the scale's arithmetic average ($M = 50$), as were mean procrastination scores ($M = 57$). By dividing the statistics anxiety components by the number of items in each scale it is possible to determine which area attracted the highest ratings. It was noted that fear of asking for help (either from tutors or colleagues $-M = 3.00$) generated the most anxiety whilst fear of statistics teachers ($M = 1.87$) generated the least.

Pearson product–moment correlation coefficients were computed between the five predictor variables (perfectionism × 3, trait anxiety and procrastination) and the six criterion measures (statistics anxiety). To prevent the occurrence of type 1 errors the probability level was re-set to $P \leqslant 0.001$. The full matrix of correlations is presented in Table 2.

None of the predictors proved to be significantly associated with worth of statistics although a positive trend for procrastinators to view statistics negatively was noted ($r = 0.23$, $P < 0.03$). Trait anxiety, socially prescribed perfectionism and procrastination were positively associated with interpretation anxiety, though none was significant at the more stringent level. Test and class anxiety was positively and significantly associated with trait anxiety, socially prescribed perfectionism and procrastination, whilst its association with self-oriented perfectionism could be described as a trend ($r = 0.27$, $P < 0.02$). Computational self-concept proved to be positively and significantly associated with self-oriented perfectionism only, though positive trends with both

Table 1
Descriptive statistics for perfectionism, procrastination, trait anxiety and statistics anxiety

| | Mean | S.D. |
|---|---|---|
| Self-oriented perfectionism | 66.98 | 16.76 |
| Other-oriented perfectionism | 59.90 | 13.33 |
| Socially prescribed perfectionism | 66.48 | 20.24 |
| Procrastination | 51.05 | 15.61 |
| Trait Anxiety | 47.34 | 14.39 |
| Worth of statistics | 32.22 | 14.94 |
| Interpretation anxiety | 28.44 | 13.27 |
| Test and class anxiety | 20.12 | 10.00 |
| Computational self-concept | 14.13 | 6.97 |
| Fear of asking for help | 11.99 | 6.04 |
| Fear of statistics teacher | 9.38 | 4.87 |

other forms of perfectionism were noted ($P$s $\leqslant 0.05$). Fear of asking for help was associated with all five predictors, though self-oriented perfectionism just failed to prove significant ($P = 0.002$). Finally, fear of statistics teachers was significantly associated with procrastination, whilst positive trends with self-oriented ($P = 0.01$) and socially-prescribed ($P = 0.03$) perfectionism were noted. Overall, higher levels of perfectionism, trait anxiety and procrastination were associated with a variety of forms of statistics anxiety.

In a separate analysis, the five predictor variables were inter-correlated to examine their associations with each other. Socially prescribed perfectionism correlated significantly with self- ($r = 0.57$, $P < 0.001$) and other- ($r = 0.54$, $P < 0.001$) oriented perfectionism, trait anxiety ($r = 0.32$, $P < 0.005$) and procrastination ($r = 0.40$, $P < 0.001$). Self- and other-oriented perfectionism emerged as significantly inter-related ($r = 0.46$, $P < 0.001$) and the association between trait anxiety and procrastination was also significant ($r = 0.32$, $P < 0.005$).

A set of six multiple linear regression equations was computed to determine which variables best predicted each component of statistics anxiety. Because of the observed pattern of correlations between predictors it was decided to include all five in each regression. The results are set out in Table 3 below. None of the variables predicted worth of statistics so these details are omitted.

Table 2
Intercorrelations between predictor and criterion variables[a]

| | Self-oriented perfectionism | Other-oriented perfectionism | Socially prescribed perfectionism | Trait anxiety | Academic procrastination |
|---|---|---|---|---|---|
| Worth of statistics | 0.025 | 0.090 | 0.099 | 0.135 | 0.228* |
| Interpretation anxiety | 0.186 | 0.116 | 0.268* | 0.307* | 0.245* |
| Test and class anxiety | 0.269* | 0.081 | 0.420** | 0.470** | 0.419** |
| Computational self-concept | 0.345** | 0.207* | 0.203* | 0.107 | 0.177 |
| Fear of asking for help | 0.322* | 0.345** | 0.470** | 0.412** | 0.417** |
| Fear of statistics teacher | 0.262* | −0.033 | 0.226* | 0.079 | 0.345** |

* $P \leqslant 0.05$. ** $P \leqslant 0.001$.

[a] Two-tailed significance levels reported throughout. For $r = 0.203$, $P = 0.05$; for $r = 0.345$, $P = 0.001$.

Table 3
Regression of all five predictors onto each component of statistics anxiety; only significant associations are displayed

| Criterion variable | Significant predictors | Beta | $t$ | $P$ | $R$ | Adj Rsq |
|---|---|---|---|---|---|---|
| Test and Class Anxiety | Trait Anxiety | 0.22 | 2.08 | 0.041 | 0.37 | 0.09 |
| Interpretation Anxiety | Trait Anxiety | 0.31 | 3.33 | 0.001 | 0.60 | 0.33 |
| | Procrastination | 0.23 | 2.37 | 0.020 | | |
| | Socially-prescribed perfectionist | 0.24 | 1.92 | 0.058 | | |
| Computational Self-concept | Self-oriented perfectionist | 0.36 | 2.85 | 0.006 | 0.39 | 0.10 |
| Fear of asking for help | Trait Anxiety | 0.26 | 2.83 | 0.006 | 0.60 | 0.33 |
| | Procrastination | 0.24 | 2.52 | 0.014 | | |
| Fear of statistics teachers | Procrastination | 0.35 | 3.25 | 0.002 | 0.47 | 0.18 |
| | Self-oriented perfectionist | 0.32 | 2.72 | 0.008 | | |
| | Other-Oriented perfectionist | −0.26 | −2.27 | 0.026 | | |

It may be seen that trait anxiety was predictive of test and class anxiety, interpretation anxiety and fear of asking for help. The latter two were also predicted by procrastination, as was fear of statistics teachers. Self-oriented perfectionism predicted computational self-concept exclusively and also contributed significantly to fear of statistics teachers. The latter was also predicted, albeit negatively, by other-oriented perfectionism. Socially prescribed perfectionism failed to predict independently any of the dimensions of statistics anxiety, though a trend was noted in the case of interpretation anxiety.

## 4. Discussion

Onwuegbuzie and Daley (1999) noted high levels of perfectionism in their graduate sample. They wondered if similar relationships with statistics anxiety would be observed among less perfectionistic students and cited undergraduates as an example thereof. They also speculated on whether or not other individual differences variables might play an equal or more substantive role than perfectionism in predicting statistics anxiety. Explicit mention of procrastination was made, based on its traditional association with perfectionism (Rothblum et al., 1986). Given the nature of the outcome variable (statistics anxiety), a further measure, namely trait anxiety, was also included by the current authors. The aim of the study was to obtain a clearer picture of the independent role of perfectionism in statistics anxiety when measures of procrastination and trait anxiety were considered simultaneously.

### *4.1. Statistics anxiety and perfectionism*

Unlike the findings of Onwuegbuzie and Daley (1999), self-oriented perfectionism proved predictive both of fear of statistics teachers and, exclusively, of computational self-concept. The former component of statistics anxiety connotes the perceived inhumanness of the teacher (Cruise et al., 1985). The higher one sets one's academic standards the more important it is that one's teachers are perceived as competent and capable of providing the requisite information to enable such standards to be achieved. As self-imposed unrealistic standards increase, it becomes less likely that any statistics teacher will measure up to expectations and may thus be perceived as a threat to success and reacted to with negative affect (fear). Indeed, examination of the five items which measure this component suggests that negative affect towards (rather than fear of) statistics teachers might be a more appropriate factor name.

The link between self-oriented perfectionism and computational self-concept may be attributable jointly to one's history of taking statistics courses and one's performance on statistics tests. By always setting unrealistically high attainment goals, self-oriented perfectionists are more likely to experience failure than success (Flett et al., 1995). Indeed, a tendency to focus on past failure is a key feature of self-oriented perfectionism (Flett et al., 1995). Accordingly, such individuals will be more inclined to think of themselves as poor at statistical computation which may account for the observed result. Whilst Onwuegbuzie and Daley (1999) found no association between self-oriented perfectionism and statistics anxiety, the current findings support those of Flett et al. (1989) who reported significant associations between self-oriented perfectionism and measures of state and trait anxiety.

Other-oriented perfectionism negatively predicted fear of statistics teachers. Part of setting high standards for the performance of statistics teachers might include the expectation that they will be understanding and sympathetic towards students who are struggling. Thus, the higher one's expectations of statistics teachers the less one needs to fear them. However, a note of caution should accompany this interpretation as the zero-order correlation between other-oriented perfectionism and fear of statistics teachers was close to zero. In contrast with the current findings, Flett et al. (1995) indicated that other-oriented perfectionism is likely to be associated with relationship difficulties, and Onwuegbuzie and Daley (1999) reported positive associations between other-oriented perfectionism and three elements of statistics anxiety: interpretation anxiety, computational self-concept and fear of asking for help.

Socially prescribed perfectionism barely predicted interpretation anxiety, though the direction of the association was in keeping with the findings of Onwuegbuzie and Daley (1999). Interpretation anxiety involves the anxiety experienced when having to choose a statistical test, when making decisions based on statistical data, and when accepting or rejecting the null hypothesis (Cruise et al., 1985). Those who feel that others expect them to be perfect (socially prescribed perfectionists) are likely to feel anxious on such occasions as the potential for making mistakes, and for subsequent negative evaluation, is high. Endler and Okada (1975) have highlighted fear of negative evaluation as a key aspect of socially prescribed perfectionism whilst Flett et al., (1995) emphasised need for approval from others. Together, fear of negative evaluation and heightened need for approval may explain the trend for socially prescribed perfectionism to be associated with interpretation anxiety. No association with other measures of statistics anxiety were noted, however. Overall, it may be concluded that socially prescribed and other-oriented perfectionism emerged as relatively poor predictors of statistics anxiety.

On balance, the relationship between perfectionism and statistics anxiety among undergraduates in the current study is different from that observed by Onwuegbuzie and Daley (1999) among graduates. Specifically, in predicting statistics anxiety, their study highlighted the importance of other-oriented and socially prescribed perfectionism whilst discounting the role of self-oriented perfectionism. From this they inferred that inter-personal rather than intra-personal aspects of perfectionism were crucial in understanding statistics anxiety. However, the current study indicates that self-oriented perfectionism is also associated with statistics anxiety and emerges as more predictive of it than other-oriented or socially prescribed perfectionism, at least when trait anxiety and procrastination are controlled. Accordingly, it may be inferred that intra-personal factors are important in understanding statistics anxiety among undergraduates. How can one account for these observed differences?

A comparison of perfectionism scores between samples indicates that undergraduates score lower on self-oriented perfectionism ($M$s = 66.98 vs. 72.33), similarly on other-oriented perfectionism ($M$s = 59.90 vs. 61.45), and notably higher on socially prescribed perfectionism ($M$s = 66.48 vs. 52.70). Effect sizes of differences between studies (Cohen, 1988) were 0.36, 0.14 and 0.84, respectively. Perfectionism components also differed within the two samples. Among undergraduates, levels of self-oriented, other-oriented and socially prescribed perfectionism ($M$s = 66.98, 59.90 and 66.48, respectively) were relatively even, whereas, among graduates, self-oriented perfectionism levels were considerably higher than socially prescribed levels ($M$s = 72.33 and 52.70, respectively). It is conceivable that different profiles of perfectionism within or between groups may give rise to differences in statistics anxiety. Further research is required to illuminate this possibility.

Alternatively, differences in statistical analyses employed in the studies might account for the discrepant findings. Onwuegbuzie and Daley (1999) employed canonical correlations whereas regression models, designed to control for the effects of trait anxiety and procrastination, were used in the current study. Given that socially prescribed perfectionism correlates significantly both with trait anxiety and procrastination (see later) it is possible that, had the effects of the latter two variables been partialled out in their study, the influence of socially prescribed perfectionism would have been diluted.

### 4.2. Statistics anxiety and trait anxiety

The capacity of trait anxiety independently to predict test and class anxiety, interpretation anxiety and fear of asking for help was not surprising. The first of these emphasises course-work and test-taking in statistics, whilst the second, as noted earlier, focuses on choice of statistic, accepting or rejecting the null hypothesis, and interpreting statistical data (Cruise et al., 1985). In both cases, the potential for making mistakes is considerable and likely to be perceived as a threat. It is well established that high anxious individuals possess cognitive processing biases which induce them to attend preferentially to sources of environmental threat and to interpret threat from ambiguous situations (Eysenck, 1997). Accordingly, high anxious individuals are more likely to attend to the threats posed by statistics tests and by having to make correct statistical interpretations, and therefore report higher levels of related anxiety.

Likewise, the link between trait anxiety and fear of asking for help may be interpreted in terms of concern about having one's ignorance exposed, a clear source of ego-threat to a high anxious individual. A similar account was offered by Onwuegbuzie and Daley (1999), though they were explaining the relationship between socially prescribed perfectionism and fear of asking for help.

### 4.3. Statistics anxiety and procrastination

Procrastination, like trait anxiety, also proved to have considerable power in predicting statistics anxiety, particularly interpretation anxiety, fear of asking for help and fear of statistics teachers. Fear of failure and consequent negative evaluation are key features of procrastination which might explain the association with interpretation anxiety which, as noted above, provides opportunities for failure (Flett et al., 1991, 1992; Pacht, 1984; Saddler & Buley, 1999). The tendency among procrastinators to suffer a variety of forms of negative affectivity (Flett et al., 1995), coupled with the reported positive association between procrastination and neuroticism (Flett et al., 1995), may account for the association between procrastination and fear of asking for help and fear of statistics teachers.

Of particular interest is that when trait anxiety and procrastination are included in the regression equations, dimensions of inter-personal perfectionism become virtually redundant in predicting statistics anxiety. This may be due to the fact that all three variables overlap somewhat. For example, trait anxiety has been associated with perfectionism (Flett et al., 1989) and procrastination (Rothblum et al., 1986; Solomon & Rothblum, 1984), and the latter has been associated with socially prescribed perfectionism (Flett et al., 1992, 1995; Frost et al., 1990). In the current study, trait anxiety correlated significantly with socially prescribed perfectionism ($r = 0.40$) and with procrastination ($r = 0.32$). The correlation between socially prescribed

perfectionism and procrastination also emerged as significant ($r = 0.32$). Moreover, when explaining the observed link between socially prescribed perfectionism and statistics anxiety, Onwuegbuzie and Daley (1999) provided what is in effect a trait anxiety-based account.

It seems as though ego involvement, manifested in evaluation concern, fear of failure and need for approval, is common to trait anxiety, procrastination and socially prescribed perfectionism. This would go some way towards explaining why socially prescribed perfectionism was found to be predictive of statistics anxiety in the study by Onwuegbuzie and Daley (1999) but largely unpredictive in the current study when trait anxiety and procrastination were controlled for in the analysis.

Nowadays, large numbers of students in higher education are required to take statistics courses as part of their academic training. Statistics anxiety has been found to be widespread among undergraduates (Cruise et al., 1985) and also to be inversely associated with academic performance (Zeidner, 1991). Given that statistics anxiety is associated with fear of failure and negative social evaluation, interventions designed to attenuate the effects of ego involvement when learning statistics might prove worthwhile and enhance academic performance among such vulnerable individuals.

## References


Adkins, K., & Parker, W. (1996). Perfectionism and suicidal preoccupation. *Journal of Personality*, *64*, 529–543.

Aitken, M. (1982). *A personality profile of the student procrastinator*. Unpublished Doctoral Dissertation, University of Pittsburg. (Dissertation Abstracts International, 43, 722-732 A.

Antony, M., Purdon, C., Huta, V., & Swinson, R. (1998). Dimensions of perfectionism across the anxiety disorders. *Behaviour Research and Therapy*, *36*, 1143–1154.

Baumeister, R. (1990). Suicide as escape from self. *Psychological Review*, *99*, 90–113.

Blatt, S. (1995). The destructiveness of Perfectionism: Implications for the treatment of depression. *American Psychologist*, *50*, 1003–1020.

Burka, J., & Yuen, L. (1983). *Procrastination: why you do it, what you do about it*. Reading, MA: Addison-Wesley.

Calvo, M., Eysenck, M., & Castillo, M. (1997). Interpretation bias in test anxiety: the time course of predictive inferences. *Cognition and Emotion*, *11*, 43–93.

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences (2nd ed.)*. New York: John Wiley.

Cooper, Z., Cooper, M., & Fairburn, D. (1985). The specificity of the Eating Disorder Inventory. *British Journal of Clinical Psychology*, *24*, 129–130.

Cruise, R., Cash, R. & Bolton, D. (1985). *Development and validation of an instrument to measure statistical anxiety*. Paper presented at the annual meeting of the Statistical Education Section and reprinted in Proceedings of the American Statistical Association.

Cruise, R., & Wilkins, E. (1980). *STARS: Statistical Anxiety Rating Scale*. Unpublished manuscript, Andrews University, Michigan.

Derakshan, N., & Eysenck, M. (1997). Interpretive biases for one's own behaviour and physiology in high-trait-anxious individuals and repressors. *Journal of Personality and Social Psychology*, *73*, 816–825.

Ellis, A., & Knaus, W. (1977). *Overcoming procrastination*. New York: Institute for Rational Living.

Endler, N., & Okada, M. (1975). A multidimensional measure of trait anxiety: The S-R Inventory of General Trait Anxiousness. *Journal of Consulting and Clinical Psychology*, *43*, 319–329.

Eysenck, M. (1997). *Anxiety and cognition: a unified theory*. Hove: Psychology Press.

Eysenck, M., MacLeod, C., & Mathews, A. (1987). Cognitive functioning and anxiety. *Psychological Research*, *49*, 189–195.

Ferrari, J., Johnson, J., & McCown, W. (1995). Assessment of academic and everyday procrastination: the use of self-report measures. In J. Ferrari, J. Johnson, & W. McCown (Eds.), *Procrastination and task avoidance: theory, research and treatment* (pp. 47–70). London: Plenum Press.

Flett, G., Blankstein, R., Hewitt, P., & Koledin, S. (1992). Components of perfectionism and procrastination in college students. *Social Behaviour and Personality*, *20*, 85–94.

Flett, G., Hewitt, P., Blankstein, R., & Mosher, S. (1991). Perfectionism, self-actualisation, and personal adjustment. *Journal of Social Behaviour and Personality*, *6*, 147–160.

Flett, G., Hewitt, P., & Dyck, D. (1989). Self-oriented perfectionism, neuroticism and anxiety. *Personality and Individual Differences*, *10*, 731–735.

Flett, G, . Hewitt, P., & Martin, T. (1995). Dimensions of perfectionism and procrastination. In S. Ferrari, J. Johnson, & W. McCown (Eds.), *Procrastination and task avoidance: Theory, research and treatment* (pp. 113–136). London: Plenum Press.

Frost, R., Heimberg, R., Holt, C., Mattia, J., & Neubauer, A. (1993). Comparison of two measures of perfectionism. *Personality and Individual Differences*, *14*, 119–126.

Frost, R., Marten, P., Lahart, C., & Rosenblate, R. (1990). The dimensions of perfectionism. *Cognitive Therapy and Research*, *14*, 449–468.

Frost, R., Trepanier, K., Brown, E., Heimberg, R., Juster, H., Makris, G., & Leung, A. (1997). Self-monitoring of mistakes among subjects high and low in perfectionistic concern over mistakes. *Cognitive Therapy and Research*, *21*, 209–222.

Gould, D., Tuffey, S., Udry, E., & Loehr, J. (1997). Burnout in competitive junior tennis players: Individual differences in the burnout experience. *Sport Psychologist*, *11*, 257–276.

Hamachek, D. (1978). Psychodynamics of normal and neurotic perfectionism. *Psychology*, *15*, 27–33.

Hewitt, P., & Dyck, D. (1986). Perfectionism, stress and vulnerability to depression. *Cognitive Therapy and Research*, *10*, 137–142.

Hewitt, P., & Flett, G. (1991). Perfectionism in the self and social context: conceptualisation, assessment, and association with psychopathology. *Journal of Personality and Social Psychology*, *60*, 456–470.

Hewitt, P., & Flett, G. (2001). Perfectionism, stress and maladjustment. In K. Craig, & K. Dobson (Eds.), *Stress vulnerability and stress resiliency*. New York: Guilford Press (in press).

Hewitt, P., Flett, G., & Ediger, E. (1996). Perfectionism and depression: Longitudinal assessment of a specific vulnerability hypothesis. *Journal of Abnormal Psychology*, *105*, 276–280.

Hewitt, P., Newton, J., Flett, G., & Callander, L. (1997). Perfectionism and suicidal ideation in adolescent psychiatric patients. *Journal of Abnormal Child Psychology*, *25*, 95–101.

Higgins, E. T., Bond, R., Klein, R., & Strauman, T. (1986). Self-discrepancies and emotional vulnerability: how magnitude, accessibility, and type of discrepancy influence affect. *Journal of Personality and Social Psychology*, *51*, 5–15.

Hoge, D., & McCarthy, J. (1983). Issues of validity and reliability in the use of real-ideal discrepancy scores to measure self-regard. *Journal of Personality and Social Psychology*, *44*, 1048–1055.

Lay, C. (1986). At last, my article on procrastination. *Journal of Research in Personality*, *20*, 474–495.

McCown, W., & Ferrari, J. (1995). *A meta-analysis of treatments for procrastination in high school and college students*. Unpublished manuscript, Northeast Louisiana University.

McCown, W., Petzel, T., & Rupert, P. (1987). Personality correlates and behaviours of chronic procrastinators. *Personality and Individual Differences*, *11*, 71–79.

Missildine, W. (1963). *Your inner child of the past*. New York: Simon & Schuster.

Mitchelson, J., & Burns, L. (1998). Career mothers and perfectionism: stress at work and at home. *Personality and Individual Differences*, *25*, 477–486.

Norman, R., Davies, F., & Nicholson, I. (1998). The relationship of two aspects of perfectionism with symptoms in a psychiatric out-patients population. *Journal of Social and Clinical Psychology*, *17*, 50–68.

Onwuegbuzie, A., & Daley, C. (1999). Perfectionism and statistics anxiety. *Personality and Individual Differences*, *26*, 1089–1102.

Onwuegbuzie, A., DaRos, D., & Ryan, J. (1997). The components of statistics of statistics anxiety: a phenomenological study. *Focus on Learning Problems in Mathematics*, *19*, 11–35.

Onwuegbuzie, A., & Seaman, M. (1995). The effect of time constraints and statistics test anxiety on test performance in a statistics course. *Journal of Experimental Education*, *63*, 115–124.

Pacht, A. (1984). Reflections on perfectionism. *American Psychologist*, *39*, 386–390.

Roberts, D., & Saxe, J. (1982). Validity of a statistics attitude survey: a follow-up study. *Educational Psychological Measurement*, *40*, 235–238.

Rothblum, E. (1990). Fear of failure: the psychodynamic, need achievement, fear of success and procrastination models. In M. Leitenberg (Ed.), *Handbook of social and evaluation anxiety* (pp. 497–537). New York: Plenum Press.

Rothblum, E., Solomon, L., & Murakami, J. (1986). Affective, cognitive and behavioural differences between high and low procrastinators. *Journal of Counselling Psychology*, *33*, 387–394.

Saboonchi, F., & Lundh, L. (1997). Perfectionism, self-consciousness and anxiety. *Personality and Individual Differences*, *22*, 921–928.

Saddler, C., & Buley, J. (1999). Predictors of academic procrastination in college students. *Psychological Reports*, *84*, 686–688.

Solomon, L., & Rothblum, E. (1984). Academic procrastination: Frequency and cognitive-behavioural correlates. *Journal of Counseling Psychology*, *31*, 503-509.

Spielberger, C. (1983). *State-Trait Anxiety Inventory*. Palo-Alto, CA: Mind Garden.

Spielberger, C., Gorsuch, R., & Lushene, R. (1970). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.

Sullivan, P., Bulik, C., Fear, J., & Pickering, A. (1998). Outcome of anorexia nervosa: a case control study. *American Journal of Psychiatry*, *155*, 939–946.

Terry-Short, L., Owens, R., Slade, P., & Dewey, M. (1995). Positive and negative perfectionism. *Personality and Individual Differences*, *18*, 663–668.

Zeidner, M. (1991). Statistics and mathematics anxiety in social science students: Some interesting parallels. *British Journal of Educational Psychology*, *61*, 319–328.

Zimmer, J., & Fuller, D. (1996). *Factors affecting performance in statistics: a review of literature*. Paper presented at the annual meeting of the Mid-South Educational Research Association, Tusculoosa, Al.