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Test Anxiety in University Students: Identification of Inherent and Acquired Factors as a Basis for Effective Interventions

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ABSTRACT

Test anxiety (TA) is a continuously growing and widespread phenomenon in contemporary Western society and it often has negative consequences for the individual's well-being, health and academic performance. The identification of predictors of TA is a prerequisite to a better understanding of TA. The present study investigated whether the inherent factors birth order and sex and the later in life acquired factors perfectionism, goal orientation and personality predict TA in university students. 132 students of the University of Westminster, London, completed a survey employing a self-report questionnaire. A hierarchical multiple regression revealed that maladaptive perfectionism, neuroticism, conscientiousness, being second or later born, being female and having had negative previous test experience were significant predictors of TA explaining 65% of the variance in TA scores. Based on these findings, the design and application of effective prevention and intervention programmes to support students at risk were suggested. Additionally, limitations of the study and suggestions for future research were discussed.

KEY WORDS:	TEST ANXIETY	PERFECTION-ISM	BIRTH-ORDER	GOAL ORIENTATION	PERSONALITY

INTRODUCTION

While anxiety is a universal emotion experienced by all human beings, the nature of the stimuli leading to anxiety has changed over time. In the past, feelings of anxiety might have been evoked by life threatening stimuli such as wild beasts, natural catastrophes or similar. However today, also social-evaluative or competitive situations lead to stress and anxiety in individuals (Zeidner, 1998). Evaluation in form of testing is used to help people to judge about others' capabilities and it affects everyone in today's achievement- and test-oriented society. Academic success is often measured by the results of tests which consequently influence and shape the academic and professional career of a person. This leads to an increased emphasis on an individual's performance and to increasing pressure, stress and anxiety, in particular, test anxiety (Conner, 2001). Consequently, TA is a continuously growing and widespread phenomenon in contemporary society and has been investigated since the 1960s (Zeidner, 1998). Recent studies estimate that more than 33% of school age children and adolescents experience some sort of TA (Methia, 2004). However, TA varies from one person to the other, i.e. certain individuals will perceive tests as more threatening and experience higher levels of anxiety when taking tests than others (Spielberger & Vagg, 1995).

TA was defined by Zeidner (1998) as "the set of phenomenological, physiological and behavioural responses that accompany concern about possible negative consequences or failure in an exam or similar evaluative situation" (p.17). According to Zeidner (1998) individuals with TA may exhibit different degrees of these responses in any given test situation. During the 1960s and 70s, Spielberger (1972) made a distinction between anxiety as a temporary state on the one hand and as a stable personality trait on the other hand. State anxiety is considered a temporary emotional condition of nervous responses and tensions experienced in an anxiety situation. Trait anxiety, in contrast, is considered a stable personality characteristic and refers to relatively stable differences in the intensity and frequency with which people experience anxiety situations. Spielberger, Anton & Bedell (1976) later argued that TA is a form of trait anxiety.

Several descriptions and models have been put forward in order to explain TA. Generally, TA is regarded as a complex and multi-dimensional construct. Liebert & Morris (1967) state that there are two basic dimensions in the experience of test anxiety: worry and emotionality. Worry refers to "any cognitive expression of concern about one's own performance" (Liebert & Morris, 1967, p.975) and this dimension is particularly found to interfere with test performance. Emotionality, in contrast, refers to autonomic reactions to the evaluation situation such as faster heart beat or increased sweat production. Later, two further dimensions were added: interference and lack of self-confidence (Hodapp, 1991). The cognitive attentional or interference model by Wine (1971) further stresses the role of cognitive factors on test performance. Due to a division of attention between task relevant and irrelevant thoughts a test anxious person is distracted from the requirements of the assignment. TA interferes with the recall of prior learning, disrupts cognitive functions and consequently leads to a decrease in performance. Similarly, Nicaise (1995) argues that when an individual experiences TA, both physical responses (autonomic reactions) as well as cognitive responses (such as concern or fear of failure) may lead to adverse emotions about the evaluation situation and may consequently

influence the performance of that person. The deficit model (Tobias, 1985) on the other hand, states that students with TA have worse study practices and test taking skills. The knowledge of their weak encoding, organisation and control of the revised test material leads to interference and increased arousal during the assessment (Benjamin, McKeachie, Lin & Holinger, 1981). While there is also a positive dimension of TA suggesting that a certain level in fact increases or facilitates test performance (Alpert & Haber, 1960), in high levels it often impairs a student's performance and health. Students high on TA feel nervous and worried before, during and after testing situations (Gierl & Rogers, 1996) and hence do not perform up to their capability when being tested (Hancock, 2001, Hembree, 1988). Hill (1972) argues that test anxious people are more sensitive to failure and react more to evaluation from others than low-anxious individuals and thus they try to avoid criticism and failure whenever possible. Students suffering from TA show poor motivation, negative self-evaluation and concentration difficulties (Swanson & Howell, 1996). Left untreated, these negative effects of TA increase over time and lead to impaired health (Swanson & Howell, 1996).

The present study investigates five potential predictors of TA previously not tested in combination, two of which are inherent (birth order and sex) and three of which are acquired later in life (personality, goal orientation and perfectionism).

Birth order
Research on this topic has shown that birth order is an important and complex variable in personality development (Gates, Lineberger, Crockett, & Hubbard, 1988) and leaves a mark which affects adult personality (Shulman and Mosak, 1977). Hembree (1988) compared later born children and firstborn children and found that later borns were more test anxious than only children and firstborns. While there is little research on birth order and TA, previous studies suggest a link between general anxiety and birth order. Firstborn children were found to have a strong need for achievement (Philips, Bedeian, Mossholder & Touliatos, 1988) and to be more apprehensive about dangerous situations (Longstreth, 1970). Additionally, Adler (1928) found that firstborn children frequently strive for perfectionism. The youngest child instead often grows up by benefiting of being the centre of attention of the family. He or she is surrounded by older siblings as competitors but often overcomes them all. According to Ansbacher & Ansbacher (1956), the youngest child is able to catch up with older siblings while being fed with love from the family and thus feeling more secure than older siblings. Schachter (1959) has demonstrated that firstborn and only children become generally more anxious than later born children when encountering an anxiety situation. According to Adler (1928), first born children lose the sole attention of their parents when the second child is born and thus experience a trauma of being "dethroned". This may lead to higher needs of attachment and achievement and in turn to higher levels of anxiety. Adler's theoretical assumptions have often, although not always, been validated. Gates et al (1988) found a relationship between birth order and anxiety but in the opposite direction. First born children were healthier, showed less depression, less anxiety and higher self-esteem compared to other groups. Bharathi & Venkatramaiah (1976), Touliatos & Lindholm (1980) and Weller (1962) in contrast state that anxiety shows no relationship with birth order.

Sex

Various studies have consistently shown that females exhibit significantly higher TA than males (e.g. Hembree, 1988; Bandalos, Yates & Thorndike-Christ, 1995; Zeidner, 1990). Seipp & Schwarzer (1996) conducted a meta-analysis on gender differences in TA among 6340 school-age students across 12 different countries. They found significant gender differences in all countries except China. Three concepts appear to exist in order to explain these differences. Deffenbacher (1980) and Müller (1980) argue that females exhibit higher levels of the emotionality component and thus show higher overall TA scores. A second explanation often given is based on general gender differences in scholastic ability (Zeidner, 1990). Correspondingly, when controlling for the level of aptitude these gender differences in TA become minimal. However, it should also be noted that TA does not necessarily result in lower test performance which therefore is unlikely to fully explain the sex differences in TA. Cassady & Johnson (2002) further argue that the heightened level in the emotionality component alone is also not sufficient to explain the gender differences in TA. They therefore suggest as a third concept that the perception of threat in an evaluative situation is a significant predictor for TA. According to their model, and consistent with Arch (1987), females tend to regard test situations as threatening rather than challenging which in turn influences their performance levels through cognitive interference.

Personality

Costa and McCrae (1990) have put forward a five factor model of personality that has become the most widely referred to theory in the literature having been replicated in over 50 cultures (McCrae et al., 2005). The five personality types in this model are openness to experience, conscientiousness, extraversion, agreeableness and neuroticism. In past research personality has been linked to TA and Chamorro-Premuzic et al (2008) found a strong direct path from neuroticism to TA as well as modest but significant direct effects of extraversion on TA. Neuroticism reflects a tendency to experience negative emotions such as anxiety and depression (Busato, Prins, Elshout, & Hamaker, 2000). Individuals scoring high on neuroticism score low on emotional stability and tend to be sensitive, moody, emotional, worrying, often depressed and may suffer from various psychosomatic disorders (Eysenck & Eysenck, 1975). Consequently, those people are more susceptible to TA than others. Emotionally stable, conscientious and extraverted individuals in contrast are generally more likely to possess positive self-beliefs and thus approach test situations in an optimistic and positive way. Chamorro-Premuzic, Ahmetoglu & Furnham (2008) found that TA can be entirely explained by personality traits. In their study, the effects of individual differences in self-beliefs were enormously weakened when personality traits, especially neuroticism, were taken into account. Despite the general notion of personality being relatively stable and unchangeable recent studies now agree that personality changes over lifetime (e.g. Lenzenweger, 1999; Lenzenweger, Johnson & Willett, 2004; Seivewright, Tyrer, & Johnson, 2002). Accordingly, Roberts, Walton & Viechtbauer (2006), in a meta-analysis demonstrated that extraversion, emotional stability and openness increased during adolescence. This may in turn positively affect, i.e. reduce, the intensity and prevalence of TA over the lifespan.

Goal orientation

In past literature, TA has also been linked to goal orientation. Goal orientation describes how an individual approaches, responds to and perceives an achievement situation (Dweck & Leggett, 1988). Elliot & McGregor's (2001) 2x2 achievement motivation framework distinguishes between approach and avoidance for mastery and performance goals. People emphasising mastery goals strive to acquire or improve competence while those with performance goals focus on knowledge relative to others and on receiving positive judgements. Approach indicates movement towards the realization of success whereas avoidance refers to the avoidance of failure or incompetence. Students with mastery goals tend to believe that ability can be increased through effort and thus they are more likely to respond to failure by trying harder. They are interested in gaining knowledge or mastering the course context (Adesope, Gress & Nesbit, 2008). In contrast, students with performance goals are less likely to believe that ability can be increased through effort and are more likely to perceive failure as an indication of their own lack of ability, leading to feelings of frustration, shame or anxiety (Bandalos et al, 1995). While this link between performance goals and TA has been confirmed in several studies such as Elliot and Church (1997) or McGregor and Elliot (2002), other studies such as Pintrich (2000) found no significant relationship between TA and goal orientation.

Perfectionism

Perfectionism is often linked with a wide variety of psychological distress. Hewitt & Flett (1991 a, b) have defined it as the tendency to set and pursue unrealistic goals and standards for oneself and to negatively evaluate the self in reaction to failure. Several groups have categorised different types of perfectionism. Hamachek (1978) for example distinguished between normal and neurotic perfectionists while Norman, Davies & Nicholson (1998) and Slaney, Rice, Mobley, Trippi & Ashby (2001) differentiated between adaptive (healthy) and maladaptive (unhealthy) perfectionism. Hewitt & Flett (1991a) have further identified self-oriented (i.e. holding very high standards for oneself and evaluate oneself stringently), other-oriented (i.e. the expectation of other people being perfect) and socially prescribed (i.e. the perception that other people expect one to be perfect and thus judge accordingly) perfectionism. While normal, adaptive or self-oriented perfectionism promote excellent performance and success and are therefore seen as having a generally positive effect on achievement, the other forms of perfectionism are often viewed as a pathological and neurotic disposition (Weisinger & Lobsenz, 1981; Flett, Hewitt & Dyck, 1989; Slade & Owens, 1998). Previous research has found that those negative forms of perfectionism were positively associated with TA (Mills & Blankenstein, 2000; Stöber, Feast & Hayward, 2009; Bieling, Israeli & Antony, 2004). These perfectionists hardly ever feel that a task has been carried out adequately and therefore blame themselves when failing to meet a certain standard (Rice & Ashby, 2007; Enns & Cox, 2002). Due to an inner urge to perform perfectly, thus to avoid being judged negatively, they are usually pushed by a fear of failure rather than by a need for achievement (Hamachek, 1978; Pacht, 1984). Consequently, these perfectionists experience distress and anxiety more intensely than non-perfectionists or adaptive perfectionists (Pacht, 1984). This is supported by correlation and regression analyses carried out in a study by Eum & Rice (2011) attributing nearly 50% of the variance in cognitive TA (the worry dimension of TA) to perfectionism and goal orientation.

Rationale for the study

High levels of TA often lead to unpleasant feelings of worry, self doubt and insecurity and as a result may impair the individual's academic performance and well-being (Hembree, 1988; Sarason, 1984). The identification of predictors adds to the understanding of TA. This allows both the identification of individuals at risk and the development of adequate forms for TA prevention and treatment. For the present study, inherent and later acquired factors were investigated as possible predictors for TA. An identification of the inherent factors birth order and sex as predictors would permit to set up early detection and intervention programmes in schools to target the development of TA in children. This might be achieved through teacher training and awareness, specific exercises for affected pupils or customised forms of lesson structures. In contrast, an identification of the acquired factors personality, perfectionism and goal orientation as predictors would allow to set up targeted forms of treatment or coping techniques to reduce TA at the stage of adolescence or adulthood. A review by Tryon (1980) for example and similarly a study by Gregor (2005) provide according evidence that cognitive behavioural approaches can be effective in reducing pupils' TA and in raising their test performance, particularly when combined with other strategies such as relaxation techniques or desensitisation.

Hypothesis of the present study

This study hypothesises that birth order, sex, personality, goal orientation and perfectionism predict TA in university students. A model of these predictors and their corresponding levels is illustrated in Figure 1.
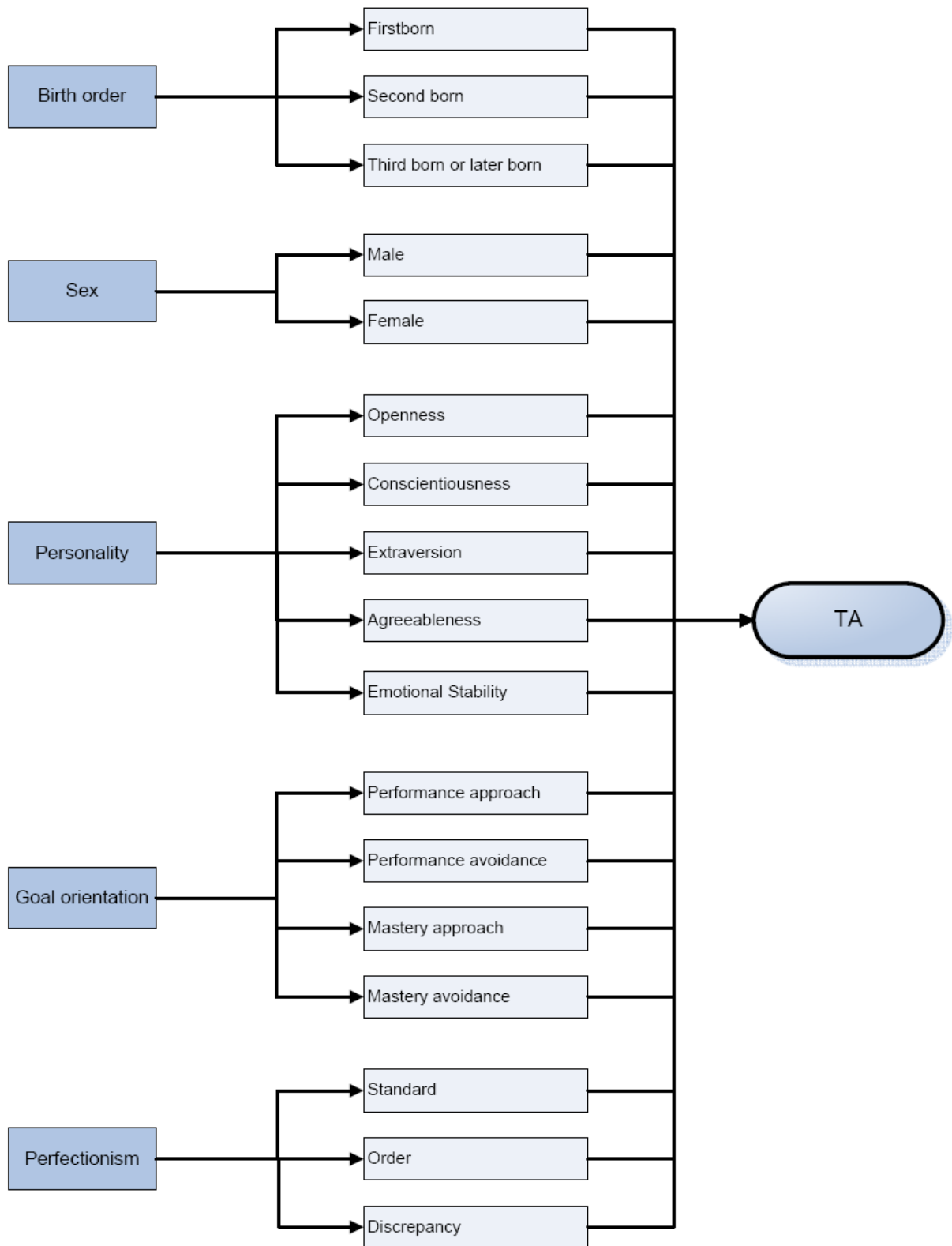
Figure 1 Model of factors predicting TA.

METHOD

Design
A survey was carried out to test a model predicting test anxiety using a self-report questionnaire. The criterion variable was test anxiety. There were five predictor variables employed: perfectionism, goal orientation, birth order, sex and personality. All variables were operationalised by a Likert scale in a self-report questionnaire.

Participants
Complete data were obtained from a convenience sample. All 132 participants were students enrolled in different courses at the University of Westminster, London. Among them, 107 were undergraduates, 22 graduates and 1 postgraduate. 124 studied full-time and 7 studied part-time. Age ranged between 18 and 45 years with a mean age of 24,42 years and a standard deviation of 6,12 years. 41 of the participants were males and 91 were females. Participation was voluntary. All participants completed the study.

Materials
A self-report questionnaire on test attitudes, composed of 5 parts, was used to collect the data (Appendix 1).

Part 1 measured the level of TA, using the Test Anxiety Inventory (TAI) by Spielberger, Gorsuch & Lushene (1970). The TAI is one of the most widely used instruments for measuring TA as a situation-specific personality trait in students. This self-report psychometric scale consists of 20 items. The respondents were asked to state how often they experience specific symptoms of anxiety before, during and after examinations by indicating their level of agreement with each statement on a 4-point Likert scale. The scale ranged from 1 = strongly disagree to 4 = strongly agree resulting in a total test anxiety score between 20 and 80 points with higher scores indicating higher TA. The scoring of the first item was reversed. The TAI comprises 2 subscales with 8 items each (scores ranging from 8 to 32 points) assessing the two main components of TA: worry (e.g. "thoughts of doing poorly interfere with my concentration on tests") and emotionality (e.g. "I feel very jittery when taking an important test").

Part 2 measured perfectionism with the Almost Perfect Scale-Revised (APS-R) by Slaney et al (2001). The APS-R is a 23-item self-report scale which assesses adaptive and maladaptive perfectionism. The APS-R contains 7 items to measure high-performance expectations (High standard subscale: e.g. "I have high expectations for myself"), 12 to capture a self-critical aspect of perfectionism (Discrepancy subscale: e.g. "I hardly ever feel that what I've done is good enough") and 4 to measure preferences for organisation (Order subscale: e.g. "I am an orderly person"). Both adaptive and maladaptive perfectionists are found to rate high in Standards and Order but maladaptive perfectionists also rate high in Discrepancy (Slaney et al, 2001). Participants responded to each item using a scale ranging from 1 = strongly disagree to 7 = strongly agree. The scores ranged from 7 to 49 for the high Standard subscale, from 12 to 84 for the Discrepancy subscale and from 4 to 28 for the Order subscale with higher scores indicating higher levels of perfectionism.

Part 3 measured goal achievement by employing the Achievement Goal Questionnaire (AGQ) by Elliot & McGregor (2001). The AGQ consists of 12 items

measuring each of the four achievement goal orientations: mastery approach (e.g. "I want to learn as much as possible from this class"), mastery avoidance (e.g. "I worry that I may not learn all that I possibly could from this class"), performance approach (e.g." My goal in this class is to get a better grade than most of the students") and performance avoidance ("My goal for this class is to avoid performing poorly"). Participants replied to each item using a seven-point Likert scale from 1 = not at all true of me to 7 = very true of me. Total scores for every goal orientation ranged from 3 to 21 each with higher scores indicating a stronger goal orientation.

Part 4 measured the "Big 5" personality types extraversion, openness, conscientiousness, agreeableness and emotional stability by employing the Mini-Marker by Saucier (1994). The Mini-Marker consists of a total of 40 traits describing personality characteristics. Participants had to indicate on a scale from 1 = how inaccurate to 9 = how accurate these traits are of them. Extraversion for example was positively scored by talkative, bold, energetic, extroverted and reversed scored by shy, quiet, withdrawn and bashful whereas emotional stability was positively scored by unenvious, relaxed and reversed scored by moody, jealous, touchy, fretful, temperamental and envious. Total scores for each trait ranged from 8 to 72 with higher scores reflecting a more distinct personality type. Since the personality traits are measured on a continuum with for example emotional stability on one and neuroticism on the other end, a person scoring low on emotional stability automatically scores high on neuroticism.

Part 5 consisted of demographic questions providing information about age (in years), gender, type of study (full- / part-time), year of study and birth order (firstborn, second born, third born or later born, only child). Furthermore it comprised five questions concerned with the participant's experiences with the course of the degree so far. Participants responded to each item using a scale ranging from 1 = strongly disagree to 5 = strongly agree. Question 4a: "My previous experiences with tests and exams have made me anxious" and question 4c: "My previous experiences with tests and exams have lead to higher test anxiety" were combined into one variable assessing negative past experiences with tests or exams. An average score was calculated, higher mean score indicating more negative past test experience.

Procedure
A 3rd year psychology student acted as researcher and used a convenience sample of students at the University of Westminster, London, to complete the survey. Students were approached in person at various locations at the university site (e.g. library, cafeteria, canteen) and asked to complete a paper-and-pencil questionnaire. Participant information (Appendix 2) was handed out and consent (Appendix 2) was sought prior to starting the questionnaire. Upon completion the participant was thanked and debriefed verbally. All participants took part on a voluntary basis and were not rewarded for their time.

Ethical Issues
The study was approved by the university's Department of Psychology Ethics Committee and a signed consent form was collected before the participant filled in the survey. The consent form and the verbal debriefing at the end of the survey provided information about the aim and purpose of the study and ensured the participant of the confidential treatment of his or her data. Participation was stated to

be voluntary and the right to withdraw from the study at anytime was highlighted. Participants were not under 18 years old and were not exposed to no potential harm.

RESULTS

The raw data are shown in the appendix "Raw Data.sav". Negative loaded items were reversed and the internal consistency (Cronbach's alpha = α) for all variables was calculated.

The scores of Cronbach's alpha indicated a high internal reliability for the scales with the exception of the low scores of the items assessing the four goal orientations. Descriptive statistics (mean and standard deviation) for the variables, the inter-item correlations and the reliability (α) for the scales are shown in Table 1. None of the variables highly correlated. The values were all acceptable.

Table 1 Mean (M) and standard deviation (SD), inter-item correlations and alpha coefficient (α) for the criterion variable and the predictor variables of the total sample (n=132).

	range	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
M		44.65	40.23	20.45	51.94	15.05	14.45	15.64	14.29	49.41	52.56	46.39	55.56	41.64	-	-	2.81
SD		13.97	6.60	5.14	15.30	3.29	3.51	3.11	3.62	10.59	10.80	10.28	8.99	11.98	-	-	.99
(1) TA	20-80	(.94)															.61***
(2) Perf.Stand.	7-49	.27**	(.86)														.10
(3) Perf.Ord.	4-28	.22**	.65***	(.83)													.03
(4) Perf.Descr.	12-84	.62***	.42***	.19*	(.92)												.35***
(5) Perform.App.	3-21	.26**	.50***	.45***	.34***	(.50)											.12
(6) Perform.Av.	3-21	.46***	.39***	.34***	.47***	.61***	(.57)										.28**
(7) Mast.App.	3-21	.42***	.27**	.17*	.43***	.36***	.50***	(.44)									.28**
(8) Mast.Av.	3-21	.36***	.27**	.25**	.44***	.60***	.64***	.65***	(.55)								.22**
(9) Openness	8-72	-.13	.13	.03	-.24**	.06	.01	-.07	-.09	(.79)							-.05
(10) Conscient.	8-72	.25**	.41***	.64***	.00	.26**	.20*	.02	.05	.12	(.82)						.01
(11) Extravers.	8-72	.02	.20*	.18*	-.02	.07	.12	-.13	-.06	.14	.29**	(.77)					-.05
(12) Agreeabl.	8-72	-.08	.14	.16*	-.23**	-.02	.15	-.17*	-.18*	.49***	.32***	.23**	(.76)				-.07
(13) Em.Stab.	8-72	-.56***	-.27**	-.11	-.57***	-.37***	-.48***	-.25**	-.36***	.03	-.11	-.22**	.19*	(.82)			-.34***
(14) Birth order		.30***	.03	.01	.18*	.16*	.20*	.11	.18*	.07	.16*	.19*	.02	-.09	-		.19*
(15) Sex		.37***	.12	.13	.16*	.03	.10	.24**	.04	-.06	.23**	.02	.07	-.15	.14	-	.20*
(16) prevex																	(.73)

Note: TA=Test Anxiety; Perf.Stand.= Perfectionism Standard; Perf.Ord.= Perfectionism Order; Perf.Descr.= Perfectionism Discrepancy; Perform.App.= Performance Approach; Perform.Av.= Performance Avoidance; Mast.App.=Mastery Approach; Mast.Av.= Mastery avoidance; Conscient.=Conscientiousness; Extravers.= Extraversion; Agreeabl.= Agreeableness; Em.Stab.= Emotional Stability; prevex= negative previous test experience; The numbers in parenthesis on the diagonal are coefficient alphas. The range indicates the min. and max. score of each variable; *p< .05; **p< .01; ***p< .001

Multicollinearity Diagnostic

None of the tolerance values were close to zero indicating that none of the predictors showed low tolerance (see appendix "SPSS Output.spv"). Therefore there was no high correlation between any predictor variables. The inference of the relative contribution of each predictor variable to the criterion variable was hence not affected.

Multiple regression analysis

The data were analysed by multiple linear regression using the hierarchical model which allows examining the amount of variance accounted for by each variable in the model by entering them in a specific order. Since the variables include inherent and later developed predictors of TA the variables were entered into the multiple linear regression according to their natural developmental sequence. Birth order and sex were entered first (model 1) and resulted in 19% of the variance (R^2 = .185). Adding the five personality factors openness, conscientiousness, extraversion, agreeableness and emotional stability (model 2) resulted in an additional 30% of the variance being explained (R^2 change = .300). Inclusion of the three perfectionism types standard, order and discrepancy (model 3) added another 8% (R^2 change = .080). Inclusion of the four goal orientations performance approach and avoidance and mastery approach and avoidance (model 4) resulted in additional 3% (R^2 change = .026). Finally, adding negative past test experience (model 5) resulted in additionally 9% (R^2 change =.087). All the above mentioned models were significant.

The final model accounts for 65% of the variance in the predicted criterion variable TA (Adj.R^2 = .649) and was significant (F (15,103) = 15.52, p < .001). Of the variables entered into the model, the strongest predictor was negative previous test experience (β = .337, t = 5.417, p < .001), followed by perfectionism discrepancy (β = .301, t = 3.512, p = .001), emotional stability (β = -.243, t = -3.050, p = .003), conscientiousness (β = .186, t = 2.335, p = .021), birth order (β = .126, t = 2.035, p = .044) and sex (β = .123, t = 2.009, p = .047). This indicates that an individual who had negative previous test experience, exhibits maladaptive perfectionism, low emotional stability, high conscientiousness, is second or later born and of female sex is likely to display TA. The following variables were not significant: openness, agreeableness, extraversion, perfectionism standard, perfectionism order, performance approach, performance avoidance, mastery approach and mastery avoidance.

Table 2 shows the unstandardised (B) and standardised regression coefficients (Beta = β), t-values, Adjusted R^2 and F-values of the predictor variables entered into the multiple regression analysis.

Table 2 B-, Beta- and *t*-values for all variables entered into the analysis as well as the Adjusted R^2 and the F- value for each model.

Model	B	β	t	Adj-R^2	F
Model 1				.19	14.43***
Birth order	3.01	.25	3.01**		
Sex	9.75	.33	3.97***		
Model 2				.47	15.82***
Birth order	2.93	.25	3.53**		
Sex	6.10	.21	2.94**		
Extraversion	-.26	-.19	-2.54*		
Agreeableness	.11	.07	.85		
Conscientiousness	.19	.15	1.94		
Emotional stability	-.63	-.54	-7.43***		
Openness	-.19	-.15	-1.85		
Model 3				.54	14.89***
Birth order	2.08	.18	2.58*		
Sex	5.63	.19	2.91**		
Extraversion	-.17	-.13	-1.77		
Agreeableness	.09	.06	.75		
Conscientiousness	.22	.17	1.85		
Emotional stability	-.38	-.33	-3.86***		
Openness	-.06	-.05	-.62		
Perfectionism Standard	-.17	-.08	- .86		
Perfectionism Order	.11	.04	.40		
Perfectionsim Discrepancy	.37	.40	4.25***		
Model 4				.55	11.42***
Birth order	2.13	.18	2.60*		
Sex	4.42	.15	2.20*		
Extraversion	-.17	-.13	-1.76		
Agreeableness	.14	.09	1.11		
Conscientiousness	.22	.17	1.88		
Emotional stability	-.39	-.34	-3.82***		
Openness	-.09	-.07	-.89		
Perfectionism standard	-.16	-.07	-.77		
Perfectionism order	.13	.05	.46		
Perfectionsim discrepancy	.31	.34	3.52**		
Performance approach	-.51	-.12	-1.30		
Performance avoidance	.50	.13	1.33		
Mastery approch	.68	.15	1.68		
Matery avoidance	-.22	-.06	-.56		
Model 5				.65	15.52***
Birth order	1.50	.13	2.04*		
Sex	3.59	.12	2.01*		
Extraversion	-.11	-.08	-1.25		
Agreeableness	.09	.06	.81		
Conscientiousness	.24	.19	2.34*		
Emotional stability	-.28	-.24	-3.05**		
Openness	-.08	-.06	-.87		
Perfectionism standard	-.14	-.07	-.76		
Perfectionism order	.10	.04	.42		
Perfectionsim discrepancy	.28	.30	3.51**		
Performance approach	-.33	-.08	-.95		
Performance avoidance	.33	.08	.97		
Mastery approch	.48	.11	1.34		
Matery avoidance	-.17	-.05	-.49		
prevexp	4.77	.34	5.42**		

Note: *$p < .05$; **$p < .01$; ***$p < .001$

DISCUSSION

The purpose of this study was to investigate whether perfectionism, goal orientation, personality, birth order and sex were predictors of TA in students. The results showed that the model was significant indicating that maladaptive perfectionism (discrepancy subscale), low emotional stability, high conscientiousness, being second or later born and being female were significant predictors of TA. At the analysis stage negative previous test experience was included into the multiple regression and revealed as significant. Hence this factor was added to the set of predictors. In total, the tested model of factors predicting TA (see Figure 2) explains 65% of the variance in TA indicating a strong model.
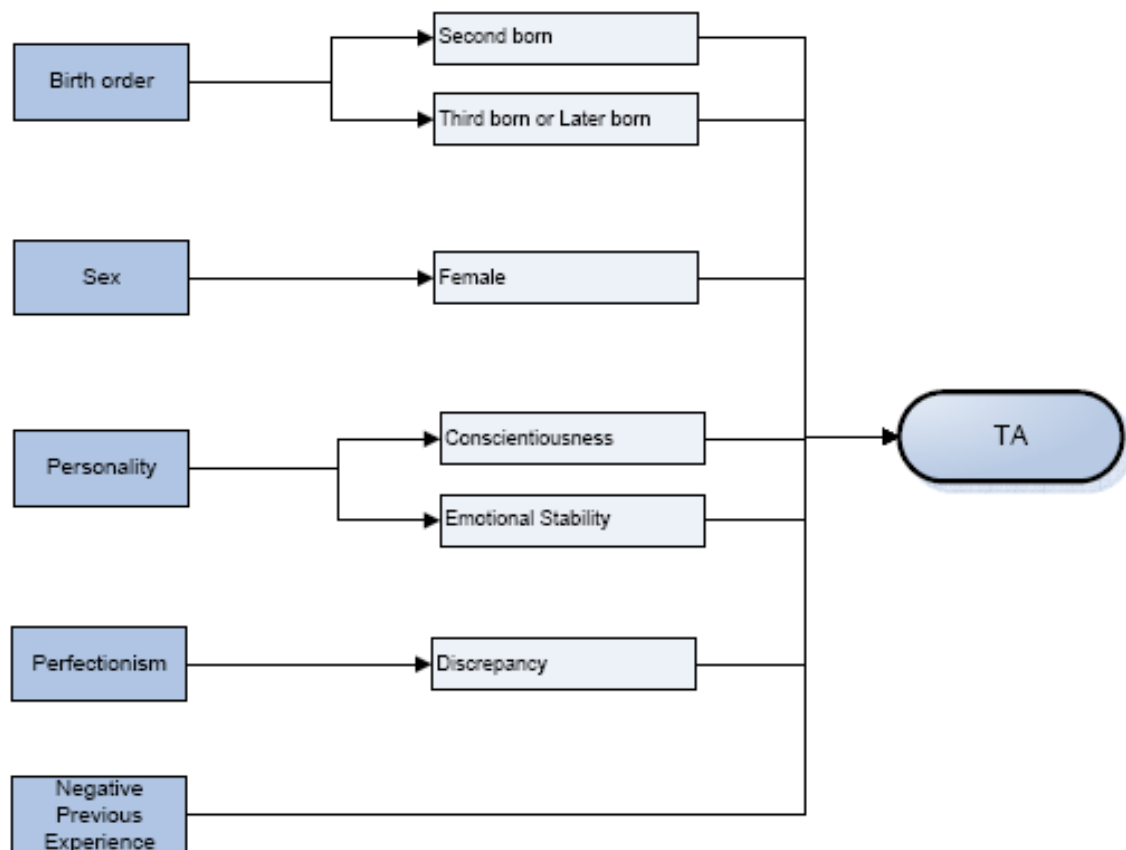

Figure 2 Tested model of factors predicting TA.

Negative previous test experience
Negative previous test experience emerged as the strongest predictor of TA. Negative test situations caused by blanking out on tests, being unable to retrieve correct answers to exam questions or lack of preparation are likely to be memorised and their recall may trigger negative emotions and apprehension in future test situations. In these cases not TA leads to poor academic performance but the awareness of poor past performance due to poor mastery of test material leads to TA. This presumption is reflected in the deficit model proposed by Tobias (1985). According to this model, poor study habits or deficient test taking skills interfere with the recall of previous learned material which consequently leads to impaired performance and hence to an increase in TA. The theory of learned helplessness

(Dweck, 1975) further suggests that the negative experience of poor performance may also lead to the development of a negative self-image. Negative thoughts such as "I am not able to do this" or "I am not clever enough" during the evaluation situation are believed to interfere with the performance and lead to the development of TA (Ganz & Ganz, 1988). Conversely, a study by Nelson & Knight (2010) found that past success experiences may serve as a source of strength and as such increase the self-efficacy of an individual to cope with the challenge of a test situation.

Since negative previous test experience was found to be the strongest predictor of TA it is particularly important to prevent such negative experiences and to provide positive test experiences instead. Interventions could therefore focus on practices that either provide regular opportunities for positive test experiences or strengthen the self-image and -efficacy. The first could be achieved by the provision of regular mock tests. The second approach could be realised by providing the student with opportunities to associate positive test results with his or her self-capability and test preparation, e.g. through precise and individual positive feedback following positive results.

Perfectionism
Perfectionism was tested for by three subscales of which discrepancy was found to be the second strongest predictor of TA. This is in line with several previous studies (e.g. Mills & Blankenstein, 2000, Stöber et al., 2009 or Bieling et al, 2004) confirming the link between maladaptive perfectionism and TA. Maladaptive perfectionists set unrealistically high standards; they are concerned with making good impressions in evaluative situations in order to not disclose their weakness or their fear of failure (Mills & Blankenstein, 2000). Furthermore, they perceive pressure from others to be perfect, permanently doubt their own actions and are characterised by a perceived large discrepancy between their performance and unrealistically high personal standards (Enns & Cox, 2002). Consequently, maladaptive perfectionists are often dissatisfied regardless of the outcome and fear test situations (Grzegorek, Slaney, Franze & Rice, 2004; Rice, Bair, Castro, Cohen, & Hood, 2003). Hewitt & Flett (1991a) also argue that negative emotional states such as anxiety arise when an individual perceives that the standards held by significant others are excessive and out of the individual's control. This is particularly salient in test situations where an individual's performance and capability becomes wholly transparent and unambiguous (Walsh et al, 2002). The disclosure of possible mistakes and the evaluation situation as such is perceived as a threat leading to anxiety which may increase over time (Onwuegbuzie & Daley, 1999, Bieling et al, 2004). Walsh & Ugumba-Agwunobi (2002) have also found that the higher the student's academic standards the higher the expectations about the teacher's academic competence will be as otherwise the teacher is not regarded sufficiently competent to convey the subject matter. Since maladaptive perfectionists are characterised by unrealistically high expectations of standard it is increasingly difficult for any teacher to meet these expectations. Consequently, the teacher is perceived as a threat to the individual's success in test situations which in turn leads to fear and test anxiety. Conversely, when the student experiences a helpful and supportive teacher the fear of test situations will reduce.

Perfectionists scoring high on the subscales order and high standards showed no significant correlation with TA. This is consistent with past literature (e.g. Mills &

Blankenstein, 2000; Stöber et al, 2009) and these adaptive perfectionists are found to be solely interested in expanding their knowledge and mastering new subjects. They may also desire a successful test outcome but this appears to be of secondary importance (Mills & Blankenstein, 2000). As such, they experience little or no TA. These positive aspects of perfectionism are widely acknowledged and valued by Western cultures and have more positive than negative consequences for the individual (Bieling et al, 2004).

Interventions could hence focus on the promotion of adaptive perfectionism by emphasising the opportunity associated with the acquisition of additional knowledge. It is important to include the social context to create a benevolent and encouraging environment as opposed to a critically evaluative one. From early on students should be encouraged to learn new material for their own interest and to regard school and the degree as an opportunity to gain knowledge as opposed to a time of competition and comparison. Additionally, students should be supported in seeing learning as a chance to develop new skills and strengthen those which are weak (Bandalos, Finney and Geske, 2003).

Goal orientation
None of the four goal orientations was found to be a significant predictor of TA and when added to the hierarchical regression analysis in model 4, no significant change emerged. While this study's finding that mastery orientations were not related to TA was consistent with several previous (e.g. Elliot & Church, 1997 or McGregor & Elliot, 2002) studies the lack of a significant link between performance orientation and TA was not. The current findings however, are in line with Pintrich (2000) who also found no significant relationship of TA with either learning (mastery) or performance orientation.

While at first sight there is no apparent explanation for the lack of a significant correlation between performance orientation and TA, some rationale may be taken from past literature. Lee, Sheldon and Turban (2003) suggest that when an individual emphasises ability relative to others and measures oneself with the performance of others this may also facilitate the mobilization of energy to demonstrate competence and to use it for the achievement of more difficult goals. This may result in higher grades and a sense of accomplishment making the testing situation a positive experience. Students may also focus on different achievement goals subject to situational circumstances. For example, students may pursue a mastery approach when studying a topic that interests them and pursue a performance approach when revising for an exam. Consequently, students who react according to this selective goal pattern (Zimmerman & Kitsantas, 1999) may not be affected by TA. Previous research has also found a positive effect of performance approach on academic achievement. Similar to athletes in sports some students may be motivated by competition (Harackiewicz, Barron, Pintrich, Elliot & Thrahs, 2002) and the opportunity to demonstrate their abilities. This motivation might be based on high levels of self-confidence and high regard of one's capabilities. Considering the reliability of the goal orientation subscales further indication for the absence of a significant correlation could be found in the sample choice. The alpha values of all goal orientation subscales were found to be very low (α between .47 and .57). Concerns over the reliability of the AGQ regarding overlapping content or value-laden items have previously been raised by Elliot & Murayama (2008) suggesting a revised version of the AGQ, the AGQ-Revised. Replication of the current study with this

revised version would be a reasonable step to improve reliability and test for differences in results.

Similar to adaptive perfectionism interventions could create a positive and encouraging situation for the student by allowing him or her to regard their degree as an opportunity to gain and display capability. Accordingly, a study by Lee et al (2001) has shown that emphasis on possibilities to improve skills and master challenges promotes a mastery orientation while emphasis on success reinforces the performance-approach.

Personality

In line with most previous research a significant link with TA could not be identified for the personality traits extraversion, openness and agreeableness. Likewise, significance could be established for neuroticism as for example demonstrated by Chamorro-Premuzic et al (2008) who found a strong direct path from neuroticism to TA. A significant link was further found for conscientiousness, yet not in line with previous studies. Individuals who scored high on conscientiousness and low on emotional stability (hence high on neuroticism) appeared to be anxious in test situations. This finding was likely to be expected for neurotic personalities who tend to feel negative emotions such as anxiety, self-conscientiousness and unhappiness (Costa & McCrae, 1992) as well as tend to have a poor self-concept (Emmite & Diaz-Guerrero, 1983). Correspondingly, studies by Chamorro-Premuzic & Furnham (2003), Halamandaris & Power (1999), Zeidner & Matthews (2000) have also consistently shown a link between neuroticism and worry, one of the dimensions of TA. High levels of neuroticism have further been linked to poorer academic performance (Anson, Bernstein, & Hobfoll, 1984).

Contrary to past research this study has not found a link between conscientiousness and TA. In studies by Chamarro-Premuzic & Furnham (2003), Busato, Prins, Elshout & Hamaker (2000), Costa & McCrae (1992) it has consistently been found to positively predict both academic and work performance and success. Individuals scoring high on this trait tend to be hard-working, organised, ambitious and thorough. They also show a high need for achievement, are extremely dutiful and stay committed and focused on a task (Witt, Burke, Barrick & Mount, 2002), thriving to excel with their performance. It is conceivable, however, that people scoring high on conscientiousness might turn into maladaptive perfectionists setting themselves high expectations. Through this pressure evaluative situations might then be experienced as a threat. Although probably unfounded, individuals might fear that their hard work and effort will not pay off, a failure which would then be unequivocally reflected by the test result.

As conscientiousness is often encouraged in schools or universities through the reward of students for being organised and self-disciplined (Komarraju & Karau, 2005) interventions could address a healthy balance between hard work, sense of duty and the value of success to avoid exaggerated conscientiousness and the promotion of TA.

Birth order

The results of the present study reveal that there is a significant correlation between second or later born individuals and TA. Past literature does not provide an undivided opinion about the role of birth order: On the one hand, the present findings are not in

line with studies such as Adler (1928), Schachter (1959), Collard (1968) or Suedfeld (1969) indicating that firstborns are more anxious than later borns. On the other hand, they are consistent with findings by Hembree (1988), Sletto (1934), Gates et al (1988) and Weller (1962) proposing that later-born children seem to be more test anxious and not as well adjusted as only children and firstborns.

Contrary to Adler's (1928) concept that firstborns suffer from more anxiety due to the act of "dethronement", Gates et al (1988) argued that this may be outweighed by the exclusive initial parental attention received by the firstborns. Yet, the current findings can also be understood in the context of the sibling influence theory (Adams, 1972). It is argued that the interactions between siblings are fundamentally responsible for the siblings' behaviour and differences in personality (Sutton-Smith & Rosenberg, 1970). Sutton-Smith & Rosenberg (1970) state that the siblings act as both role model and competitor, thereby influencing their own development. Younger siblings need to compete harder as they often remain in the shadow of their older siblings. From birth, the younger sibling is confronted with competition and rivalry around the parents' attention as well as other resources. During the first years the younger sibling often loses due to the disadvantages in age and strength. This early experience then leads to higher anxiety in competitive and evaluative situations. Weller (1962) suggests that the development of TA may also be influenced by other factors relating to the sibling constellation such as number and sex of siblings, sex ratio and age difference between siblings. Collard (1968) for example reports that last borns separated by at least five years from their younger sibling resemble firstborns in terms of anxiety and fear as opposed to siblings with only small age difference. Future studies could hence take account of this aspect. A further explanation for the findings of the present study refers to economic status. Elder (1962) reports that in high socio-economic status (SES) families the oldest receives more parental encouragement and has higher aspirations and greater likelihood of achievement while in low SES families it is the youngest who benefits from the ordinal position. Similarly, Blau & Duncan (1967) state that the oldest has a slight educational advantage in small families whereas it is the youngest in large families. It could be argued that in both scenarios the beneficiary might exhibit less TA compared to the other siblings. Consequently, it might be speculated that due to the significance found with later borns in the present study family size was small and SES was high. However, since SES and family size was not assessed here future studies could take this aspect into consideration.

Overall, the relationship between TA and birth order is inconclusive as a number of differing explanations have been put forward by previous studies. Various factors may additionally influence this relationship. Further, especially long-term studies, are required to investigate possible links between sex and age difference of siblings, the quality of the relationship between children and parents, parenting styles and expectations since these factors could influence and mediate the development of TA in individuals.

Sex

The results of the present study are consistent with previous findings such as Gierl & Rogers (1996); Hembree (1988); Seipp & Schwarzer (1996) where females were found to score higher on TA than males. Similar to Arch (1987), the cognitive appraisal model of TA (Schwarzer & Jerusalem, 1992) states that females perceive evaluative situations as more threatening than males do. These perceptions of threat

by females have been proposed to arise from self-doubt regarding the ability to cope with an exam or perform in an evaluative setting (Arch, 1987; Zohar, 1998). Research on sex differences and general anxiety explains these higher perceptions of threat through evolutionary influences. Due to their natural need to protect and nurture their offspring women tend to worry more when faced with potentially threatening situations (Craske, 2003). Since worry is one of the components of TA this may explain the link between TA and females. Research by Robichaud, Dugas, & Conway (2003) indicates that most self-reported adult worriers are women. A worrying person tends to have a negative problem orientation which is related to low perceived control over a problem. It may be that due to caregivers' over control during childhood women tend to develop the perception of having less control over their environment. Thus, women may perceive themselves as less able to cope with threatening situations (McLean & Anderson, 2009). In threatening situations women tend to seek support from others instead of relying on their own strength and coping resources. This perspective may be reinforced by the view of traditional gender roles as prevalent in most societies, namely that men and women are expected to respond differently to threat. From early on, boys are believed to learn that the masculine role means being brave and being able to cope with anxiety-provoking situations (Bern, 1981) and might also have to face more of these situations, hence might have more routine in dealing with them. In most societies, feelings of anxiety are still often less tolerated in men. Boys are generally encouraged to focus on how to solve a problem and how to control their emotion rather than focusing on the experience of the emotion itself (Greif, Alvarez & Ulman, 1981). Compared to males it is considered to be more acceptable for females to be emotional and to exhibit fears (Gates et al, 1988). Consequently, men may feel less anxiety in evaluative situations or at least pretend to. Due to the nature of the study which employs a self-report questionnaire males may have answered according to this socially desired direction thus not resulting in a correlation with TA.

A further effect may be linked with stereotype threats defined as "the immediate situational threat that derives from the broad dissemination of negative stereotypes about one's group—the threat of possibly being judged and treated stereotypically, or of possibly self-fulfilling such a stereotype" (Steele & Aronson, 1995, p. 798). Some women, especially when enrolled in typical male-dominated subjects, such as maths or physics, may feel that they cannot keep up with men as men tend to excel in these subjects (Rodarte-Luna & Sherry, 2008). This may lead to a fear of failure and anxiety. However, this effect is here believed to be small due the type of degrees offered on the campus where the survey was conducted. Further research could investigate the influence of sex on TA with sample groups from typically male- or female-dominated degrees.

Research by Lake, Eaves, Maes, Heath & Martin (2000) also shows a higher heritability of anxiety-related vulnerability factors among women compared to men. Additionally, heritability had a significantly higher influence on the variability in neuroticism among women. Similarly, Eley (2001) found a higher heritability for fear and phobias in women.

Implications of the findings
Since evaluating capability through tests happens inevitably in almost every person's life it is important that test results correctly reflect a person's capability without being influenced negatively by TA. Experiencing TA at high levels is a central problem in

education and affects many students in different countries (Hill & Wigfield, 1984; Methia, 2004). TA can have a negative impact on the individual's well being and the experienced distress may lead to impaired performance in evaluative situations and consequently to an impairment in overall academic achievement and motivation. The present study helps to gain a deeper understanding of TA and the factors that predict it. The findings offer a basis for the design and application of effective treatment dependent on the type of predictor. By identifying inherent and acquired factors as significant predictors leading to TA, targeted teaching and evaluation methods as well as intervention programs can be designed and established to support students at risk.

Further interventions

Possible interventions vary depending on the type of predictor identified as significant in this study. The inherent predictors would allow the identification of groups at risk of developing TA at an early age possibly well before TA would actually be present. Thus, prevention measures can be initiated. In comparison, predictors of the acquired type provide opportunities for effective treatment of TA by directly addressing the underlying personal characteristics or experience. Responsibility for the application of these measures particularly lies with the organisation of pre-schools, schools and universities to effectively counteract TA. Besides the interventions detailed earlier in this study the following measures provide further suggestions to cope with TA.

At the centre of the problem, a change in evaluation practices may be a good start to reduce or prevent TA. Grade reports could be modified so that individuals are evaluated not only on ability but also on effort (Hill & Wigfield, 1984). Letter grades should not be employed until the early middle or high school years. Instead, progress reports could be used to describe a student's achievement, effort, abilities, strength and weaknesses in subject areas. This would result in a reduction of evaluative pressure, social comparison and competition in grading. The student's self-confidence and ambition to expand and master knowledge should be promoted. From early on, teachers should tend to focus on giving positive feedback for any progress made rather than highlighting the negative. The process of learning and of managing test situations must be experienced positively in order to master these situations successfully and to perceive them as not threatening. A pupil needs to be encouraged to appreciate a testing situation as a possibility to demonstrate his or her knowledge and not as a situation of judgement. Exam situations focusing on a more interpersonal exchange of knowledge, for example similar to an oral exam or a presentation, may be suitable to achieve this. Furthermore, intervention programmes at schools or universities could teach affected students effective coping mechanisms for managing their TA by applying a variety of cognitive-behavioural and behavioural strategies combined with relaxation programmes. Efficient reduction of TA can help the student to master his academic career successfully, to increase his or her academic performance and to regain self-confidence and motivation.

Limitations

The results of the study should be interpreted with caution due to a number of limitations. The correlational design as such does not allow any causal inferences amongst the factors under investigation. Additionally, the generalizability of the results is limited as the students participating in this study were from one university only and hence not representative for the whole student population. They are likely to

differ from other students with regard to the relationship among the variables studied. As questionnaires can be administered economically and objectively they are usually a valid and reliable tool for measuring people's attitudes and opinions. However, a number of concerns should be raised. Students may have not been entirely accurate in their reporting due to the self-report nature of the questionnaire. Social desirability, i.e. the tendency to portray oneself in a favourable light (Edwards, 1957) might have affected the participants' responses. Some students, in this study particularly male, might have possibly been embarrassed of their TA and might have believed that it was not socially desirable to be anxious. Hence they may pretend not to be so. One possibility to control for this effect would have been to assess the social desirability and to statistically adjust the content of the test scores (Egloff & Schmuckle, 2002). Furthermore, students might have shown demand characteristics (Orne, 1962), i.e. they may have tried to respond in a way pleasing the experimenter. In addition, the tendency to agree rather than disagree, known as response acquiescence is another possible limitation of self-report questionnaires. As a result of questions being closed rather than open-ended the participants' views or perceptions might not have been captured accurately. Free response questions would offer more flexibility and deliver richer information. However, these questions are difficult to score and not objective hence bring about further disadvantages. Situational variables were not controlled for while the survey was completed, i.e. participants completed the questionnaire during term time on campus and consequently some may have answered questions in a rush or momentary mood to the detriment of accuracy. No attempt was made to investigate potential factors which may moderate the relationship between TA and the predictor variables. These factors may include coping strategies which are either successful or ineffective in decreasing levels of TA in students. Sawyer & Hollis-Sawyer (2005) also point out that there may be different temporal phases during which the experience of TA differs considerably. These are the pre-exam phase (anticipatory stage) which often begins several days before the exam, the exam phase (confrontation stage) and the post exam phase (outcome stage). The Spielberger TA inventory employed in the present study assessed TA in different phases of an evaluation situation. However, most questions were based around experiencing TA when the individual is already in the actual evaluation situation (confrontation stage) thereby not fully accounting for this effect.

Future research
Besides those suggestions mentioned in the individual predictor sections earlier in the discussion future research could also address mediating factors that influence the development of TA as well as its possible consequences to the individual. Mediating factors that could play a role in suppressing or aggravating the effect of predictors include parents and carers and the effect of their parenting styles. While some parents may for example put high pressure on their children to perform well, thus potentially promoting TA, others may potentially reduce TA by giving support and encouragement. Additionally, the school environment such as class rooms, noise, light or the presence of others is also believed to have an influence on the development of TA. In a study by Gregor (2005) students pointed out that cold examination halls and teachers walking up and down with hostile faces both lead to an increase in TA. Understanding these influences may help in designing more suitable test environments for students.

Regarding the consequences of TA future studies should also look at the effect of TA on academic performance and subsequent choice of professional career. It is also of

interest whether an individual's awareness of TA influences his or her decision to start a degree in the first place knowing that he or she will be faced with situations that will be perceived as anxiety provoking.

Conclusion

TA is a widespread phenomenon in education and can affect the well-being, motivation and future career of an individual. The present study investigated whether inherent and acquired factors predict TA in university students in order to define measures for prevention and effective intervention. The results showed that negative previous test experience, maladaptive perfectionism, neuroticism, conscientiousness, having older siblings and being female all predict TA. Contrary to most previous studies, performance orientation was not found to be significant. This may result from the low reliability scores of the items. On the basis of the findings intervention programmes and strategies to reduce TA in affected students can be developed and introduced in schools and universities. This could help students suffering from TA in succeeding in their academic life and could also provide a more realistic and valid measurement of their ability and effort. The main limitations of the study lie in the nature of the design as a self-report questionnaire and the limited generalizability due to the university student sample. Future research could focus on sample groups outside the university and could also take into consideration mediating factors and consequences of TA.

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