Anxious women or complacent men? Anxiety of statistics in a sample of UK Sociology undergraduates

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Abstract

One of the most commonly identified obstacles in the learning-teaching of quantitative material is statistics anxiety. Of the factors analysed in relation to statistics anxiety, age and gender have received a substantial proportion of the research focus. Yet there is limited work that systematically examines the possibility of an interrelationship, or interaction, between age and gender and reported statistics anxiety. This article aims to directly address this gap in the research by examining this interaction. A secondary analysis of data gathered from across 34 institutions in the UK is undertaken. The research presented is the first to examine this issue using a multivariate-modelling framework in a UK context. Although the international literature tends to indicate that women disproportionately experience statistics anxiety, the findings here show women have a moderate likelihood of reporting anxiety. There is a group of unworried young men who are likely to require pedagogical attention. Indeed, it may be that the existence a group of complacent young men have women *seem* anxious by comparison.

Keywords: pedagogy, statistics anxiety, quantitative methods, sociology, gender, age

Introduction

Quantitative methods courses are commonly considered some of the least popular modules that students take during their degree programme (Murtonen, 2005). One of the most commonly identified obstacles in the learning-teaching of quantitative material is statistics anxiety, which has received sustained international attention (e.g. Suárez-Pellicioni et al., 2016; Chew and Dillon, 2014; Onwuegbuzie and Wilson, 2003). Previous research has identified statistics anxiety not only as a factor affecting students' performance in quantitative methods modules (Baloğlu and Zelhart, 2003; Fitzgerald et al., 1996; Onwuegbuzie and Wilson, 2003), but as a factor that also limits students' enjoyment of, and engagement with, these modules, prompting some to actively avoid such modules (Paxton, 2006; Murtonen, 2005; Schacht and Stewart, 1990). In order to understand how statistics anxiety manifests itself, researchers have extensively mapped a range of antecedent factors (Onwuegbuzie and Wilson, 2003). Of these factors, age and gender have received a substantial proportion of the research focus (e.g. Baloğlu et al., 2011; Papanastasiou and Zembylas, 2008; Hong and Karstensson, 2002; Onwuegbuzie, 1998). Yet there is limited work that systematically examines the possibility of an interrelationship, or interaction, between age and gender and reported statistics anxiety. Considering these antecedents together, this article aims to directly address this gap in the research.

A secondary analysis of data gathered by Williams et al. (2009) is presented. Moving away from the small-scale single site study that predominates this type of research (e.g. Baloğlu, 2003; Bell, 2003; Royse and Rompf, 1992), these data were collected from across 34 institutions in the UK. The analyses presented here are a response to Baloğlu's (2003) call for further research on associations between age-gender and statistics anxiety. The guiding research question is: Do age and gender interact in their

relationship with reported statistics anxiety? Bivariate relationships are shown, indicating whether men or women, or younger or older sociology students are more likely to report statistics anxiety. Using a multivariate-modelling framework, the research is the first to examine age-gender interactions in a UK context, where previous analysis has been undertaken in an American or Turkish setting (Baloğlu, 2003; Baloğlu *et al.,* 2011).

The article begins by summarising issues of definition and measurement of statistics anxiety. The literature on the antecedents of statistics anxiety is then introduced with a focus on findings relating to gender and age. There is a section on data and methods, followed by results where it is shown that age and gender interact. The implications of this are expanded in the discussion and conclusions sections, where it is argued that the findings have repercussions for pedagogical practice and the research literature.

Statistics anxiety

Statistics anxiety has been defined as anxiety that comes to the fore when a student encounters statistics in any form and at any level (Onwuegbuzie et al., 1997). Distinct from mathematics anxiety (Chew and Dillon, 2014; Baloğlu, 2002), it is associated with prior negative attitudes towards statistics (Chew and Dillon, 2014) and is characterised as an enduring anxiety that has longstanding importance/consequences for individuals (Macher *et al.,* 2015). Although different definitions foreground alternative aspects of the concept, they share common features. These include the idea that students experience anxiety when there is an expectation they will engage with statistics. The definitions also imply that the anxiety experienced has negative outcomes for learners.

Research into statistics anxiety concentrates on students in higher education undertaking non-maths degrees, especially samples from psychology, business and health courses (Author A). A number of instruments have been developed to assess statistics anxiety. The most widely used of these is the Statistics Anxiety Rating Scale (STARS). Originally created by Cruise *et al.* (1985), STARS consists of 51 items, with responses scored on a five-point Likert-type scale. These items are organised into six different subscales: Worth of Statistics, Interpretation Anxiety, Test and Class Anxiety, Computation Self-concept, Fear of Asking for Help, and Fear of Statistics Teachers. The scale is considered to measure anxiety of, and, attitudes to, statistics. Chew and Dillon (2014) recommend the use of the first 3 sub-scales of STARS as the most validated measure of statistics anxiety available. Various alternative measures have also been proposed to capture levels of statistics anxiety, but these have been less widely used. These include Zeidner's (1991) Statistics Anxiety Inventory, designed to capture test and content anxiety; the Statistics Anxiety Scale - SAS (Pretorius and Norman, 1992); the Statistics Anxiety Measure (Earp, 2007); and the Statistics Anxiety Scale by Vigil-Colet *et al.* (2008).

In keeping with the debate over definitions of statistics anxiety and the variation in measures available, there is also debate over the proportion of students who may experience statistics anxiety. Koh and Zawi (2014) found that only 21.7% of their sample of 141 Malaysian education postgraduate students reported experiencing statistics anxiety in some form, while Onwuegbuzie and Wilson (2003) stated that as many as 80% of graduate students experience statistics anxiety. There are baseline assessments of the proportion of sociology students who experience statistics anxiety available.

DeCesare (2007) presents research from an institution in the USA where 43%, who responded to a survey on a social statistics unit, reported no anxiety (n=169). Williams *et al.* (2008) similarly found a slight majority (52%) reported being anxious about statistics in a sample of sociology and political science students in England and Wales (n=738)[i]. These studies are helpful in offering descriptive assessments levels of SA, but also have limitations. Like DeCesare (2007), research in this field is often conducted on a single institution, yet it is not clear that findings can be generalised from institutional context. Also, neither study incorporated a validated measure of SA but asked only about feelings of anxiety towards statistics. The limitations in the field means there remains considerable gaps in our understanding of the relationship between statistics anxiety and antecedent factors among students studying sociology.

A range of antecedent factors of statistics anxiety has been identified within the literature. These have been categorised as environmental (mainly sociodemographic factors), situational (often related to experience) and dispositional (related to self-perception and confidence) (Onwuegbuzie and Wilson, 2003). Situational antecedents comprise prior knowledge of maths and statistics. These have been measured using variables such as previous grade level, whether a student has already completed courses in statistics/maths or not, and measures of ability, such as correct responses to diagnostic questions (e.g. Fitzgerald et al., 1996; Hamid and Sulaiman, 2014).

Dispositional antecedents of statistics anxiety cover self-concept and level of self-esteem (Macher et al., 2011, 2013; Onwuegbuzie, 2003; Onwuegbuzie and Wilson, 2003). These antecedent factors have been studied using measures such as self-assessed academic ability (Zare et al., 2011). Preferences in modes of learning and the application of learning behaviours have also been measured as dispositional antecedents (Macher et al., 2011, 2015).

Socio-demographic antecedents comprise factors such as age, gender and ethnicity (Papanastasiou and Zembylas, 2008; Maltby, 2001; Onwuegbuzie, 1999; Zeidner, 1991). Epistemological concerns have also been identified as potentially associated with statistics anxiety and include the idea that students do not engage with statistics because they are not seen as appropriate or legitimate (Wilensky, 1997). In sum, statistics anxiety is generally defined as negative and measurable, affecting a proportion of students and predicted by a variety of factors.

Statistics anxiety and gender

Of the antecedent factors described by Onwuegbuzie and Wilson (2003), the relationship between gender and statistics anxiety is one of the most commonly studied. Women and girls have often been reported as having higher levels of statistics anxiety (Baloğlu et al., 2011; Papanastasiou and Zembylas, 2008; Hong and Karstensson, 2002; Bradley and Wygant, 1998) and maths anxiety (Hill et al., 2016; Zettle and Raines, 2000; Pajares and Kranzler, 1995) than men and boys. These findings echo research that has identified women as more likely to express anxiety of any kind (Remes et al., 2016). Research has also suggested that women experience a greater amount of anxiety than men on specific dimensions of the STARS scale (Baloğlu et al., 2011; Baloğlu, 2003). Although most studies find that women experience more/higher anxiety of statistics than men, there are a number of articles which find

no such association (Trimarco, 1997; Benson et al., 1994; Sutarso, 1992). There is also research which finds *higher* reported anxiety in men than women (e.g. Koh and Zawi, 2014).

Despite the general finding that women are more at risk of statistics anxiety than men, the differences are often small and interpreted as representative of previous experience rather than biology (see, Chipman, 2005). For instance, in a study of 323 educational psychology students at an American university, Rodarte-Luna and Sherry (2008) reported statistically significant differences in STARS levels between men and women. They concluded, however, that the magnitude of the variation was small and indicative of an inconsequential difference. While they found a limited overall difference in statistics anxiety between genders, they found important differences in how statistics anxiety manifests in the learning strategies of men and women. Procrastination and organisation were found to be associated with higher levels of statistics anxiety for men, whereas a wider range of other learning behaviours was found to relate to statistics anxiety in women. This included the use of procrastination, rehearsal (reciting items from a list to be learned), organisation and elaboration (paraphrasing or creating analogies) which were found to relate to higher levels of statistics anxiety. A difference in how statistics anxiety is manifested was also found by Zeidner (1991), who, using the Statistics Anxiety Inventory (SAI) measure of statistics anxiety, reported that women had higher levels of test anxiety than men (the first part of SAI). But that men had higher levels of statistics content anxiety than women (the second part of SAI). Zeidner argued that gender differences might occur in samples where there was less course work in maths, but that these gender differences were small and showed little correlation to course grades. Instead, statistics anxiety was likely to be experienced by anyone who felt they were not adequately prepared.

Statistics anxiety and age

Whilst there have been numerous studies considering the association between statistics anxiety and gender, the relationship between statistics anxiety and age is comparatively under-researched. Early studies in the area found no relationship between age and statistics anxiety (Roberts and Saxe, 1982; Feinberg and Halperin, 1978). More recent work has suggested that older students experience more maths/statistics anxiety when taking the same module than younger students (Bell, 2003; Onwuegbuzie, 1999; Royse and Rompf, 1992). These results also present a complex picture. For instance, Bell's (2003) study of 121 undergraduate business students found that those aged 25 and older recorded significantly higher scores on one STARS subscale (Test and Class Anxiety). However, the higher scores on the anxiety scale were not significantly associated with course performance. Bell (2003) argued that although students aged 25 and older did achieve lower course grades this was not due to statistics anxiety only. Wider interests and circumstances, such as family responsibilities, played a part in limiting the time available for older students to devote to the course.

These studies have only accounted for age as a single influencing factor; relatively few studies have attempted to systematically test for a relationship between gender, age and statistics anxiety. In a comparison of reported statistics anxiety between a student sample (n=460) in two countries (Turkey and USA), Baloğlu *et al.* (2011) incorporated age, gender and grade point average (GPA) as covariates. Significant differences in statistics anxiety between men and women were recorded on several STARS

sub-scales when controlling for GPA and age. This cross-national comparison expanded the method previously applied by Baloğlu (2003) on a single site study in Turkey. This study used STARS, previous mathematical experience, age and gender variables. Here, younger age groups were found to report less perceived use for statistics, perhaps indicating an unclear sense of the utility or legitimacy of these types of approach. In these studies, the overall difference found between genders in the levels of statistics anxiety was small. There were age-gender patterns, with older women having the highest total statistics anxiety, and older men the lowest total statistics anxiety.

Data and Methods

For the current study, the data analysed were collected by Williams et al. (2009)[ii] and are available from the UK data archive. These data were gathered from a sample of 34 universities in England and Wales. The total number of cases is 738; there are six item missing cases on the variables analysed, so the analytic sample is 732. The data were gathered to describe attitudes to quantitative methods in general (Williams et al., 2008) but provide substantial scope to explore the relationship between statistics anxiety and gender and age. Although these data are amongst the most comprehensive ever collected on the attitudes of sociology and political science students to quantitative methods, they have not previously been used to model age/gender and statistics anxiety.

An item included in the survey asked individuals to respond to the statement: *The idea of learning statistics makes me feel anxious* (Table 1). Categories of possible response were *Agree*, *Disagree*, *Not sure*. This item is a simple measure of self-reported anxiety in the context of social science quantitative methods. This outcome was modelled as multinomial and dichotomous. For ease of interpretation, only the dichotomous results are reported here as results from both models were similar. On checking the outcome using a multinomial model, the direction of the coefficients for responses on the *Disagree* and *Not Sure* categories were identical, whilst the magnitudes were similar. On this basis it was decided to collapse these categories together as it leads to a simpler interpretation of a dichotomous outcome. This dichotomous model merges the *Disagree* and *Not sure* categories, contrasting those who agree they are anxious of statistics with those who do not positively identify as anxious. The analysis uses logistic regression, and log-odds are reported along with conditional marginal probabilities. The category in which people report being anxious is coded as one. A positive association between the dependent variables and the independent variable signifies a higher likelihood of having reported being anxious about statistics.

[Table 1 about here]

Gender is recorded as dichotomous and included in the models with men as the reference category. Following on from Bell's (2003) study, age was included as categories with those 24 years and younger contrasted with a group 25 years and older. Age was also tested as linear and quadratic, but the simple dichotomy provided clear substantive conclusions. Age and gender were interacted in the modelling. The results were also stratified by age and gender, to check consistency. In addition to log-odds, conditional marginal probabilities of the interaction are reported (Williams, 2012). These represent the condition of the control variables set as their reference category.

A situational and a dispositional antecedent - whether an individual has a recent maths qualification and whether they reported being good at maths - are respectively included in the model, as controls. Prior maths experience has been characterised as an important situational antecedent of statistics anxiety (Hamid and Sulaiman, 2014; Onwuegbuzie and Wilson, 2003; Fitzgerald et al., 1996). The survey required an individual to confirm the level of their most recent qualification and individuals were asked whether this included maths. The maths qualification variable is therefore sub-optimal, only controlling for whether the *most recent* qualification obtained included maths. Nevertheless, it might be expected that a recent math qualification would be associated with lower anxiety. This variable, controlling for whether a respondent has recently obtained a maths qualification, is included in the models as a control variable. A dispositional antecedent measuring self-perception of maths ability is also incorporated (Zare et al., 2011). Self-assessed maths ability was coded in three categories: those who agree they are good at maths, those who disagree and those who are not sure. Those who agree that they are 'good' at maths are included as the reference category, contrasted with those who 'disagree', and those who are 'not sure'.

The analyses are incorporated in three stages. First, bivariate associations between explanatory variables and the outcome are briefly introduced (Table 1). A modelling approach is presented which includes the factors age and sex separately (Table 2 model 2.1). Then, age and sex are modelled as an interaction (Table 2 models 2.2 and 2.3) and this relationship is also considered by stratifying the analysis by age and sex (Tables 3 and 4, in Appendix 1).

[Table 2 about here]

Results

In the bivariate context, the contingency table (Table 1) suggests that there is no meaningful association between anxiety and gender. There is a weak association between anxiety and age (Phi=0.1, $p<0.01$). Those aged 25+ are more likely to agree that they are anxious, than those who are 24 years or younger. The indicators capturing whether an individual recently passed a maths qualification (Phi=0.17, $p<0.00$) and self-reported maths ability (Cramer's V=0.38, $p<0.00$) show more substantial bivariate associations.

[Figures 1 and 2 about here]

The models in Table 2 estimate the relationships between the independent variables and the outcome. Model 2.1 (Figure 1) suggests that gender is not significantly associated with different odds of reporting anxiety between men and women, net of the other variables included in the model (age, recent maths qualification and self-reported academic ability). The older age group have a significantly higher chance of reporting anxiety and the level is quite large with a logged-odds (lo) of 1.1 (confidence interval (ci) .56, 1.7). Model 2.2 controls for the same variables as model 2.1, but specifies an interaction between gender and age. In this instance, the interaction is specified as a four-level variable of all possible combinations of age and gender. The reference category is men, 24 years old and under. All other categories on the variable exhibit substantially higher logged-odds of reporting anxiety.

Model 2.3 (Figure 2) provides an alternative specification of the interaction. The model is statistically identical, although the output differs. Specified in this manner the male-female estimate expresses

contrasting odds of reported anxiety between young women and young men. The age coefficient describes the relationship between older men and younger men. The interaction term indicates how much the influence of gender changes when the younger group are considered instead of the older group (Kohler and Kreuter, 2009).

Marginal estimates of the interaction are also reported as conditional probabilities in Table 2. The marginal conditional probabilities for the interaction categories show the predicted probability that an individual in a category reports that they are anxious, with the other variables set as having a maths qualification and reporting good maths ability. Young men have a low additional probability of disclosing anxiety (conditional probability -cp- 0.1, ci .04, .16) and older men have a higher probability of identifying as anxious (cp .64, ci .41, .86) whilst older women (cp .25, ci .12, .38) and young women (cp .21, ci .12, .29) have similar probabilities that fall between the younger and older men.

The other control variables included in the models may be considered to measure confidence (whether an individual considers themselves to be good at maths) and maths background/experience (whether their most recent qualification included maths). Those who do not identify as being 'good' at maths have a higher log-odds of reporting anxiety, than those who report being good (e.g. those who disagree they are good at maths, lo 1.8, ci 1.4, 2.1). Those whose most recent previous qualification included maths have lower odds of reporting anxiety (lo -.79, ci -1.3, -.29). The direction of these associations are consistent across models, though the magnitude and *p*-values vary somewhat.

As indicated by the model fit statistics, such as the Bayesian Information Criteria score (BIC) (Raftery, 1999), the model specified with the age/gender interaction is a better expression of the relationship between gender, age and anxiety than the model without this. The interaction highlights a gender difference in the odds of being anxious, which is absent from both the bivariate cross tabulation and the model controlling for gender and age as dummy categories. Here, it is suggested that younger women and older women are more likely to report anxiety than young men, but less likely to report anxiety than older men. Stratifying by gender there are no significant differences between older women and younger women (Appendix 1). From these analyses, it seems reasonable to put forward that a lower odds of 'young' men (those aged below 25) reporting anxiety drives the age association reported in model 2.1.

Discussion

Associations between gender, age and statistics anxiety have been reported within the research literature. However, results vary. Some studies report no association between statistics anxiety and gender (Rodarte-Luna and Sherry, 2008; Trimarco, 1997; Benson et al., 1994; Sutarso, 1992). While, others suggest that women are disproportionately affected by statistics anxiety (Papanastasiou and Zembylas, 2008; Zeidner, 1991). There is also research which found higher levels of statistics anxiety in men than women (e.g. Koh and Zawi, 2014). Fewer studies directly consider age, but there are also some which found no association (e.g. Roberts and Saxe, 1982) whilst others found that older students were more likely to experience statistics anxiety (Bell, 2003). The findings here show that it is not women, but older men, who are most likely to report experiencing statistics anxiety (model 2.1). This seems to contrast with Baloğlu (2003) who found older women to report the highest levels of anxiety. The age-gender interaction illustrates that the largest difference in likelihood of reporting statistics

anxiety is between the younger male group and the older male group. The women from the older and younger age groups have a similar likelihood of reporting anxiety. The low likelihood of anxiety for younger men drives the differences reported. It is possible that a lack of anxiety in a group of complacent young men, rather than excessive anxiety in women, characterises the gendering of findings previously reported (e.g. Baloğlu et al., 2011; Papanastasiou and Zembylas, 2008).

Statistics anxiety and maths anxiety are generally considered to have negative consequences for learners (Paxton, 2006; Murtonen, 2005; Schacht and Stewart, 1990). These include negative emotions (Pekrun et al., 2002) and avoidance behaviours (Blaikie, 2003). There is also some evidence that statistics anxiety is associated with poorer course performance (Zare et al., 2011; Onwuegbuzie, 2003). It would be undesirable to focus attention solely on these facets of statistics anxiety, if this is only one part of a more complex problem. Research highlights multiple approaches that are known to reduce anxiety in the context of maths learning (e.g. Jamieson et al., 2016; Núñez-Peña et al., 2015). These may have a positive influence on the older male group, found here to be the most likely to report anxiety, and on women with a moderate likelihood of reporting anxiety. The pedagogical implications of a lack of concern in young men requires more consideration (DeCesare, 2007). Indeed, it is also suggested that statistics anxiety can have a positive influence in motivating learning behaviours across a course (Macher et al., 2015). The low level of statistics anxiety in young men may relate to factors such as bravado, apathy or disengagement (Marshall, 2014; Stahl, 2013; Deed, 2008; Rock, 2004; Foster et al., 2001) and these present their own pedagogical challenges. The learning-teaching of statistics is complex, and it is probable that different pedagogical strategies will have different outcomes for diverse groups (Griggs et al., 2009). The findings here indicate the need for sophisticated learning-teaching approaches that acknowledge issues such as anxiety and complacency. It is likely that this will be contingent and context specific and require the complex layering of a range of pedagogical strategies and tactics.

Conclusion

These analyses examine the relationship between gender, age and self-reported anxiety of statistics. This article draws upon data on the attitudes of sociology students to quantitative methods collected at over thirty universities in the UK (Williams et al., 2009). This is the most robust sample to date examining age, sex and associations with reported statistics anxiety. The results suggest an association where young men (24 and younger) were least likely to report anxiety of statistics. Older men (25 and older) were most likely to report anxiety, with women coming between these two groups. There were no significant age differences evident between older women and younger women. This indicates a more complex relationship between gender, age, and anxiety of statistics, than has been previously reported (e.g Papanastasiou and Zembylas, 2008; Trimarco, 1997; Benson et al., 1994; Sutarso, 1992). It also contrasts with Baloğlu (2003), who found older women were most likely to report higher levels of statistics anxiety. The pedagogical implications of statistics anxiety are complex. This work highlights that pedagogical approaches to teaching methods should take account of gendering and age as factors influencing the anxiety students experience in relation to statistics. Although the international literature tends to indicate that women disproportionately experience statistics anxiety, the findings here reveal

that there is a group of unworried young men who may be likely to need just as much pedagogical attention. The implications of complacency among learners of statistics has received none of the attention given to anxiety. An unconcerned approach to study could be a strategy that works better on substantive courses than on methods courses. It might be that the average level of anxiety reported by women is a benefit when it comes to learning to apply social statistics (Macher et al., 2015). Indeed, it may be complacent young men that make women *seem* anxious by comparison.

Limitations and implications for future research

There are limits to these analyses. The outcome variable is a simple measure of self-reported anxiety, rather than a statistics anxiety scale. Anxiety scales have been specifically designed to measure an intensity of anxiety and benefit from published validity testing. A multiple item measure was unavailable in the data. On this issue, Gogol (2014) writes that single item alternatives are appropriate in educational research where multi-item scales are not available. Given this, the analyses here do not necessarily contradict the previous findings. It is possible, although unlikely, that women could consistently report a higher intensity of anxiety than men even though an older age group reports a lower chance of feeling anxious in the first instance. The results here show that future research into statistics anxiety should routinely control for age, gender interactions.

[i] These are the data also analysed here. Although these data are freely available they have only been used to report base line attitudes of sociology students to quantitative methods. In this respect they represent an untapped resource.
[ii] UK data archive study - SN 6173

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Table 1, Descriptive statistics: bivariate tables of the independent and dependent variables

	% Do not agree (n)	**% Agree** (n)		
Learning statistics makes me feel anxious?	**54** (339)	**46** (393)	p-value	Phi/Cramer's V
Gender				
Male	**52** (65)	**48** (60)	0.16	0.05
Female	**45** (274)	**56** (333)		
Age				
<=24	**48** (312)	**52** (338)	0.01	0.10
>=25	**33** (27)	**62** (55)		
On the whole I am good at maths.				
Agree	**66** (213)	**34** (108)	0.00	0.38
Disagree	**26** (78)	**74** (226)		
Not Sure	**45** (48)	**55** (59)		
Last qualification obtained included maths.				
Yes	**66** (72)	**34** (37)	0.00	0.17
No	**43** (267)	**57** (356)		

n= 732
Source: Williams *et al.* 2009, SN: 6173

Figure 1, Model 2.1

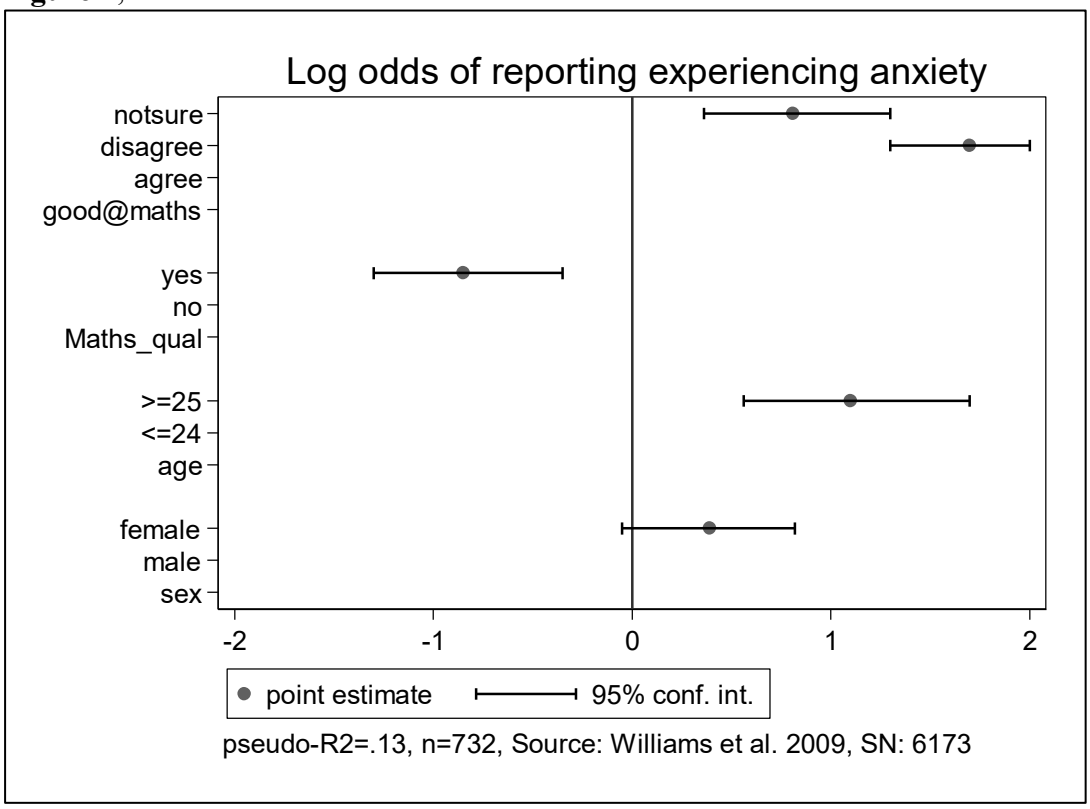

Figure 2, model 2.3

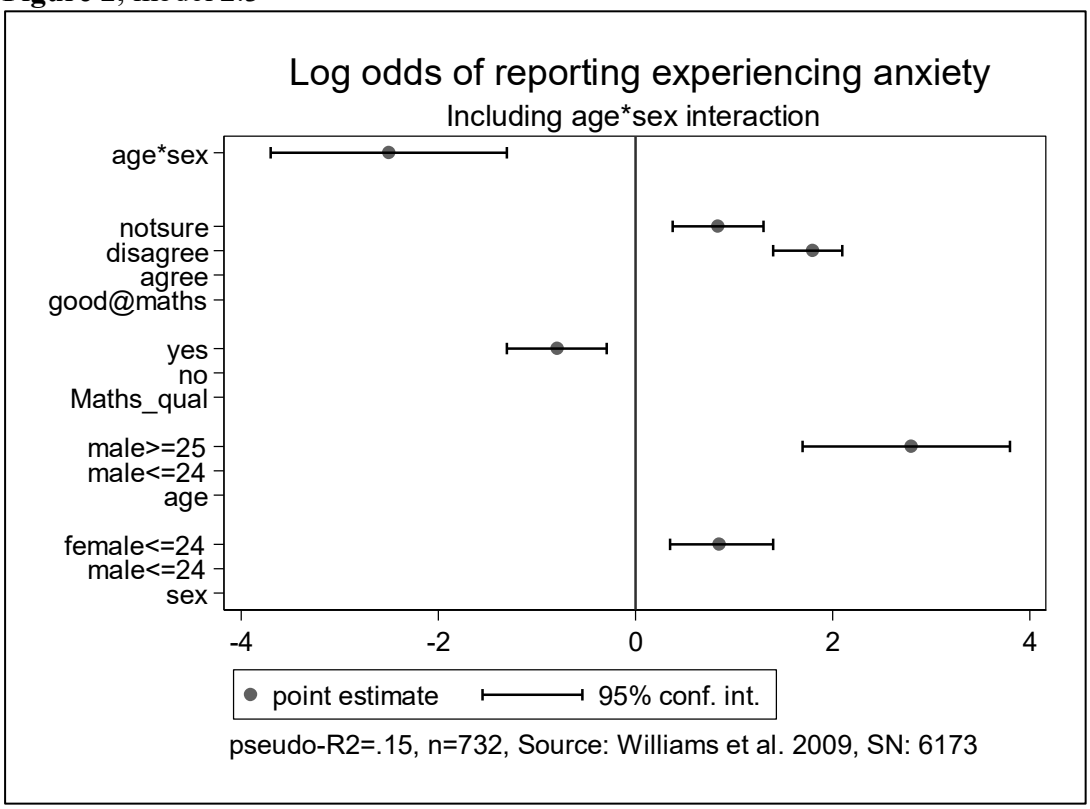

Table 2. Logistic models. The outcome is whether an individual agrees they feel anxious about statistics as contrasted with those who either disagree or do not know whether they feel anxious about statistics. The results are log-odds, except the final column where conditional probabilities of the interaction are reported at the base category of the control variables

		Model 2.1				Model 2.2				Model 2.3				Conditional probabilities		
		Log-odds	se	lci	uci	Log-odds	se	lci	uci	Log-odds	se	lci	uci		lci	uci
Gender	Male	-	-	-	-					-	-	-	-			
	Females	.39	(.22)	-.051	.82					.85***	(.26)	.35	1.4			
Age Group	Age <=24	-	-	-	-					-	-	-	-			
	Age >=25	1.1***	(.29)	.56	1.7					2.8***	(.54)	1.7	3.8			
Maths qualification	No	-	-	-	-	-	-	-	-	-	-	-	-			
	Yes	-.85***	(.25)	-1.3	-.35	-.79**	(.26)	-1.3	-.29	-.79**	(.26)	-1.3	-.29			
I am good at maths	agree	-	-	-	-	-	-	-	-	-	-	-	-			
	disagree	1.7***	(.18)	1.3	2	1.8***	(.19)	1.4	2.1	1.8***	(.19)	1.4	2.1			
	not sure	.81***	(.23)	.36	1.3	.84***	(.24)	.38	1.3	.84***	(.24)	.38	1.3			
Age gender	Male age<=24					-	-	-	-					.10***	.04	.16
interaction	Male age>=25					2.8***	(.54)	1.7	3.8					.64***	.41	.86
	Female age<=24					.85***	(.26)	.35	1.4					.21***	.12	.29
	Female age>=25					1.1**	(.4)	.32	1.9					.25***	.12	.38
	Age*Gender									-2.5***	(.63)	-3.7	-1.3			
Constant		-.96***	(.23)	-1.4	-.51	-1.4***	(.27)	-1.9	-.89	-1.4***	(.27)	-1.9	-.89			
Log-likelihood		-440				-431				-431						
McFadden'spseudo-R2		.13				.15				.15						
BIC null-model	1020															
BIC		919				908				908						
N		732				732				732						

Source: Williams *et al.* 2009, Study Number: 6173, downloaded from the UK data archive
Model 3.1, logit model
Model 3.2, logit model with an interaction specified unconventionally as a combination of all possible categories and in comparison to a base category
Model 3.3, includes a multiplicative interaction and main effects
Conditional probabilities, estimated with the other predictors set as having a maths qualification and reporting good maths ability
*p<=0.05, **p<=0.01, ***p<=0.001
se, standard error
lci, lower confidence interval, 95%
uci, upper confidence interval, 95%