D.RA.MA: An Extended Conceptualization of Student Anxiety in Criminal Justice Research Methods Courses

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The challenges of teaching research methods and statistics to students majoring in criminology and criminal justice are well known. The professor has to deal with an array of obstacles among students, including *D*isinterest, *R*elevance *A*rgumentation (viewing statistical skills as detached from the "real world") and *M*ath *A*nxiety (*D.RA.MA*). This paper presents the development of an assessment scale to measure the levels of "D.RA.MA" experienced by students enrolled in research methods or statistics courses. The literature is vast on "math anxiety scales." However, trepidation on the part of criminal justice students who are anticipating their research methods and statistics courses may extend beyond math anxiety. Therefore, the traditional math anxiety scale was extended to include attempts at measuring *D*isinterest and *R*elevance *A*rgumentation. Readers are provided with the D.RA.MA scale instrument and data from an assessment of 80 students in criminal justice courses. Assessing this broader student apprehension may serve as an important first step in making the necessary efforts to reduce student apprehension towards these classes.

Introduction

Students are often resistant and anxious about taking their *required* (or few would enroll) research methods and statistics courses. While this problem in criminal justice curricula has long been recognized (Brown 1982), it persists, perhaps almost as intensely, over a quarter century later. This apprehension has been widely viewed as rooted in math anxiety and it is well documented that this represents at least a portion of the underlying problem, but it appears to extend beyond this. Many students majoring in criminal justice or criminology are *disinterested* in this portion of their curriculum, perhaps because they were initially seeking a major and career direction not perceived as entailing quantitative skills. Stereotypes of the criminal justice major as leading to either "CSI"

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or "helping profession" careers may attract students who are generally disinterested in research methods and statistics. Teaching the disinterested is a related, but somewhat different, challenge than contending with *math anxiety*. A third obstacle arises when students do not appreciate the value or relevance of the course they have been forced to enroll in order to fulfill degree requirements. It is not uncommon for the professor teaching research methods or statistics to find himself/herself fielding questions the first day of class (or even more discouraging, midway through) along these lines: "Why do I have to take this class?" or "What does all of this have to do with working in criminal justice?" Such queries, especially when repeated or aggressively phrased, might be termed *relevance argumentation*. This paper reconceptualizes student resistance to research methods and statistics classes as a broader construct comprised of *D*isinterest, *R*elevance *A*rgumentation and *M*ath *A*nxiety (D.RA.MA). It proposes a new scale derived from each of these three potential sources of student resistance and apprehension.

Disinterest

Readers of this paper likely have been charged with teaching research methods or statistics courses or have related curricular concerns. The common bond in teaching or designing quantitative courses is that a portion or even majority of students lack interest in the subject matter. We hear the protests in the halls; see it on their faces and student grades often reflect that indifference. This student disinterest negatively impacts the quality of classes, risking a downward spiral wherein the instructor is at risk of relinquishing quality standards or falling into a routinized or robotic pedagogical approach.

While student interest levels vary based on overall program quality and type of students attracted, disinterest in quantitative classes appears widespread and logically distinct from math anxiety. To assess this proposition, we must measure levels of disinterest along with the more documented problem of math anxiety. Following this broader conceptual scheme, we may then turn to the question of addressing both student disinterest and math anxiety. Assessments of both can inform pedagogy, curriculum planning, and student recruitment.

Relevance Argumentation

Closely related to student disinterest, yet conceptually distinct, is another potential problem for those teaching research methods and statistics courses. It represents students' failure to comprehend the relevance of such course work to their field of study and view statistical skills as specifically detached from the "real world." The faculty member may find this component of D.RA.MA the most trying. Students engaging in relevance argumentation can be the most negative and resistant. In addition to their own poor performance, they can

undermine class dynamics through their open negativity, discouraging the student experiencing only "math anxiety" from seeking the assurances needed. It may encourage the merely "disinterested" student to adopt relevance argumentation as a defense mechanism for their less problematic rejection of course content. In short, students clinging to the view that the class is not just boring, but irrelevant, can set in motion dynamics that can demoralize both fellow students and the instructor.

In a review by Lanier (2002), the reader is reminded of the importance of statistical skills to criminal justice and criminology majors. Most government agencies, including the criminal justice arena, as well as private industry, routinely rely on data analysis. Criminal justice students ultimately employed in these venues will be handicapped if not prepared for quantitative tasks. Walsh and Ollenburger (2001, as cited in Lanier 2002) argue that in the future, an understanding of statistics will be as important to the educated person as reading was to our great grandparents. Regrettably, however, for the average criminal justice or criminology major this connection may not be apparent. If the students conceptualize little utility from the skill, they will be less personally vested in the learning process and notably detract from the classroom environment. Once again, this suggests the need to recognize student relevance argumentation as another component of an unprepared and unmotivated student population. Along with disinterest and math anxiety, this characteristic needs to be examined in assessing student recruitment and socialization, curriculum design, and pedagogy.

Math Anxiety

Math anxiety has several definitions, but overall it refers to the panic, helplessness, and mental distress that arise for some when they anticipate having to solve math-related problems (Fiore 1999; Tobias 1978; Tobias and Weissbrod 1980). Ashcraft and Kirk (2001) find that it does not require conventional arithmetic and math problems to trigger the math-anxiety reaction; it only needs to be a counting-like process (e.g., counting through letters in the alphabet). Therefore, the anticipation of the need for any level of math skills may be enough to trigger anxiety for research methods and statistics students in criminal justice.

Statistics anxiety is also noted in the literature and has been defined as anxiety that occurs as a result of encountering statistics in any form (Onwuegbuzie, DaRos, and Ryan 1997). Betz created the math anxiety scale in 1978, and Pretorius and Norman altered it to a statistics anxiety scale in 1992. The latter merely substituted the word "statistics" for "math." Unlike the relevance argumentation and disinterest concepts, the reality of math anxiety has been well cited in the literature for many years (see Betz 1978; Pretorius and Norman 1992). The dread of statistics is so established that one text by Kranzler and Moursund (1999) is specifically entitled *Statistics for the Terrified* (Lanier

2002). In 1992, researchers at the University of Florida circulated a questionnaire to 9,093 students and found that over one quarter had a moderate to high need of help with math anxiety (Jones 2001). One analysis reveals that over two-thirds of all Americans fear and loathe math (Burns 1998, as cited in Furner and Duffy 2002).

It is clear that many of our students have minimal mathematical background and have considerable math (and statistics) anxiety. This paper incorporates existing math (and statistics) anxiety scales, supplementing with newly developed scales to measure "disinterest" and "relevance argumentation." The composite of these three concepts constitutes the D.RA.MA scale for research methods and statistics courses.

D.RA.MA

The D.RA.MA scale consists of 20 directionally coded items. Ten questions are borrowed from the Math Anxiety scale. Five are newly created items that assess statistics *Disinterest* and another five are intended to tap statistics *Relevance Argumentation.* The items for the collective D.RA.MA scale and each of its three subscales are displayed in Table 1.

Results

D.RA.MA scale data collected from three criminal justice classes totaling 80 students from a mid-sized regional comprehensive university in the southern region are presented. Scale scores for Disinterest, Relevance Argumentation, Math Anxiety and a total composite for D.RA.MA are provided. Higher scale scores represent more disinterest, relevance argumentation, or math anxiety.

There were 27 students in Group 1 who completed the D.RA.MA scale on the first day of a research methods class. The class was comprised of 52% males and 48% females. Grade point averages (GPA) for the class ranged from 2.0 to 3.8 with a mean of 2.6 and median of 3.0. Ages ranged from 19 to 34 with all but two students between 19 and 22. Ninety-six percent (all but one) were criminal justice majors and most (70%) were juniors and seniors. Seventy percent started at the university as freshmen and the remaining were transfer students. About half of the students had academic minors (52%) and 82% indicated that this was their first research methods class.

The Math Anxiety Scale responses for Group 1 ranged from 2 to 29 with a mean (*M*) of 15.6 and a median (*Mdn*) value of 14. The response for Relevance Argumentation ranged from 0 to 8 with a mean and median of 5.4 and 5.0, respectively. The Disinterest scores ranged from 1 to 11 ($M = 7.03$, $Mdn = 7.0$), while composite D.RA.MA values ranged from 14 to 45 with $M = 28$ and $Mdn = 26$.

Another 27 students were included in the sample from a second section of a research methods course and completed the D.RA.MA scale on the third day of

Table 1 D.RA.MA scale

D.RA.MA scale instrument: Subscales
Math Anxiety
I usually have been at ease in math classes.
Math does not scare me at all.
I am no good at math.
I don't think that I could do advanced math.
Generally, I have been secure about attempting math.
For some reason, even though I study, math seems unusually hard for me.
Math has been my worst subject.
My mind goes bland and I am unable to think clearly when working in mathematics.
I think I could handle more difficult math.
I am not the type to do well in mathematics.
Relevance Argumentation
I will need research methods for my future work.
I view research methods as a subject that I will rarely use.
Research methods is not really useful for students who intend to work in Criminal Justice.
Knowing research methods will help me earn a living.
Research methods does not reflect the "real world".
Research Disinterest
I am exited about taking research methods.
It would not bother me at all to take more research methods courses.
I expect a research methods class to be boring.
I don't expect to learn much in research methods.
I really don't care if I learn anything in research methods, as long as I get the requirement completed.

*Recode for directional uniformity before analysis.

class. This section consisted of 63% males and 37% females with GPA ranging from 2.0 to 3.8 (M = 2.6, Mdn = 2.9). Ages ranged from 19 to 23 and 93% were criminal justice majors. The class was nearly equally divided between sophomores (37%), juniors (37%), and seniors (26%). Seventy-four percent started at the university as freshmen with the remaining transferring from other institutions. Fifty-nine percent declared academic minors and 96% indicated that this was their first research methods class.

The Math Anxiety Scale responses for Group 2 ranged from 0 to 30 with a mean score of 13.3 and a median of 11. Relevance Argumentation subscale scores ranged from 0 to 12 with M = 5.2 and Mdn = 5. The Disinterest scores ranged from 1 to 15 with M = 6.9 and Mdn = 7, while the full D.RA.MA scores were 8 to 43 (M = 25.4, Mdn = 25).

The third class consisted of 26 students surveyed on the second day of an introductory criminal justice class. This group included 58% males and 42% females with an average GPA of 3.0 (Mdn = 3.2). Ages ranged from 18 to 23, with all but two falling between 18 and 21. Fifty-four percent were criminal justice majors and most (69%) were freshmen and sophomores. Sixty-five percent of them reported having academic minors.

The Math Anxiety Scale scores for Group 3 ranged from 0 to 28 (M = 12.8, *Mdn* = 12). Relevance Argumentation ranged from 1 to 12 (M = 5.5, *Mdn* = 5.0) and Disinterest ranged from 2 to 12 (M = 7, *Mdn* = 7). Composite D.RA.MA scores spanned from 5 to 50 (M = 25.2, *Mdn* = 25).

Mean comparison tests show no difference between the three classes for composite *D.RA.MA* scores (F = .844, p > .10), *Math Anxiety* (F = 1.05, p > .10), *Relevance Argumentation* (F = .069; p > .10) or *Disinterest* (F = .028, p > .10). Equivalent responses across three different classes provided preliminary support for the reliability of the D.RA.MA measure and its three subscales. Since statistical comparison of means show no difference in scores between the classes, the remainder of data analysis will be reported by combining all three classes in a single group. The combined data are further examined in the context of reliability and validity of the D.RA.MA measure and its contributing subscales.

D.RA.MA Measurement Issues

The combined sample (n = 80) was comprised of 81% criminal justice majors and 91% students with no prior course in research methods. The gender ratio was 42 females to 58 males and the average age was 20. Most (79%) entered the university as freshmen and about half had elected to declare a minor. The mean reported GPA was 2.8 (*Mdn* = 3.0). Table 2 displays mean scores for D.RA.MA and each of the three subscales for each of the three classes and for the combined sample now under examination.

Multicollinearity

Because three different components are used in the measurement of D.RA.MA, it is important to consider the issue of potential multicollinearity. The D.RA.MA scale would appear ripe for multicollinearity issues because the questions comprising each subscale seem to bear resemblance; however, it is argued from a theoretical perspective that there are three distinct D.RA.MA dimensions (disinterest, relevance argumentation, and math anxiety). It is important to rule out the possibility that these three subscales are highly intercorrelated because they are simply a reflection of a single underlying concept rather than distinct subscales. The dominant rule of thumb is that concern with excessive

Table 2 Mean scores for D.RA.MA and subscales by group and combined

Group	Disinterest	Relevance argumentation	Math anxiety	D.RA.MA
Research methods, G1	7.0	5.4	15.6	27.7
Research methods, G2	6.9	5.3	13.3	25.4
Introduction to CJ, G3	7.0	5.5	12.8	25.2
Combined sample	7.0	5.4	14.0	26.2

Table 3 D.RA.MA subscale intercorrelations

		Disinterest	Relevance argumentation	Math anxiety
Disinterest	Pearson correlation	1	.618**	.081
	Sig. (2-tailed)		.000	.480
	N	80	80	79
Relevance argumentation	Pearson correlation	.618**	1	.009
	Sig. (2-tailed)	.000		.934
	N	80	80	79
Math anxiety	Pearson correlation	.081	.009	1
	Sig. (2-tailed)	.480	.934	
	N	79	79	79

**Correlation is significant at the 0.01 level (2-tailed).

multicollinearity may be safely dismissed if all pairs of subscales within a combined scale are correlated below .80. Judging by this old standby criterion, the three subscales appear quite distinct. Table 3 shows that *Disinterest* and *Relevance Argumentation* are not significantly correlated with *Math Anxiety*, suggesting that they are distinct constructs. The correlation between *Disinterest* and *Relevance Argumentation* (.618) is appreciable, suggesting that while they do share a lot of variance, considerable independence remains.

A more conservative diagnostic tool for multicollinearity is to regress each subscale on all other subscales and screen for excessive R^2 values (Allison 1999). If appreciable variance (e.g., .40) remains unexplained after regression on the other subscales, this more stringently supports the conclusion that the overall scale is comprised of empirically and theoretically meaningful subscales. Regression of *D.RA.MA* on the other subscale pairs resulted in respective R^2 values of .39, .39 and .01 leaving $1\text{-}R^2$ (unexplained variance) at .61, .61, and .99. This provides a very strong support for the conclusion that *Disinterest, Relevance Argumentation,* and *Math Anxiety* are conceptually and empirically distinct. In short, it appears that the D.RA.MA scale provides a more extensive measure of the attitudinal factors that undermine the learning experiences of criminal justice students in research methods and statistics courses than does the *Math Anxiety* scale alone.

Test for Internal Reliability

Scale reliability is a function of (1) items tapping an underlying concept and (2) the number of items incorporated. So long as additional items largely reflect the same theoretical concept, the inclusion of more measures will yield a more reliable measurement instrument. The optimal measurement scale yields high correlations between items and is parsimonious. The Cronbach's alpha is the most common reliability coefficient employed in scale construction and assessment,

Table 4 Scale measures: Cronbach's alpha

Scale instrument	Cronbach's alpha	Standardized items	Number of items in scale
Math anxiety	.962	.963	10
Relevance argumentation	.807	.808	5
Disinterest	.774	.769	5
D.RA.MA	.894	.880	20

with a rule of thumb that a Cronbach's alpha ≥ .80 reflects a good scale. Table 4 shows impressive Cronbach's alpha obtained for all three subscales and the composite D.RA.MA scale.

Implications of D.RA.MA

The phenomenon of *math anxiety* has long been recognized as undermining student performance in research methods and statistics courses. For example, statistics is identified by colleagues in two closely allied disciplines as "one of the most anxiety-provoking courses that most sociology students are required to take" (Schacht and Stewart 1992:329) and "the most dreaded part of the curriculum for social work majors" (Marson 2007:199). These authors premise the solution to pedagogical improvement on the common assumption that "this anxiety is due to the fact that most of our students have very limited background in mathematics" (Schacht and Stewart 1992:329) and the assertion that such courses "have been traditionally based on 'mathematical requirements'" (Marson 2007:200). Findings with 80 students enrolled in three undergraduate criminal justice classes, however, suggest that an even broader and more problematic student resistance underlies such courses. Criminal justice faculty who have taught in the discipline for many years have observed that students entering their statistics and research methods classes are now better prepared than was once the case. They are likely to have stronger math backgrounds, be more computer literate and received exposure to more complementary courses. While it is encouraging that the discipline has matured in these regards, agreement remains among faculty members teaching statistically based courses that student resistance persists.

The D.RA.MA scale presented in this paper identifies *disinterest* and *relevance argumentation* as part of the broader problem of student resistance to statistics and research methods. Perhaps these obstacles pose even greater challenges to effective teaching and learning than does the storied *math anxiety*. Further research is needed to more fully delineate the nature of student resistance to these courses. It will also be instructive to compare the relative contribution of distinct D.RA.MA components among criminal justice students relative to both individual characteristics and other majors.

It is important to conceptualize D.RA.MA, and to estimate its scope in criminal justice and criminology curricula if we are to make pedagogical advances. The scale presented here can serve as a tool for assessing both the nature and extent of the problems and pedagogical efforts to address them. A variety of instructional strategies can be inferred from the D.RA.MA challenge, but it is important to recognize that no single approach will connect with all students. An ongoing challenge for the faculty member teaching statistically based courses will be to experiment and incorporate the most effective strategies.

Casting academic material in a popular culture framework has been well received in recent years and may provide one useful vehicle for combating student *disinterest* and *relevance argumentation* in the criminology statistics class. Incorporation of humor is another viable approach. Greenwald and Nester (2004), for example, report using the animated series' *The Simpson's* and *Futurama* in teaching math classes. Schacht and Stewart (1990) suggest that use of cartoon examples in statistics focused classes is helpful. It makes sense that humor holds the potential to disarm both disinterest and argumentative claims that the material is not relevant as well as reassuring those suffering from math anxiety. These broader pedagogical trends have led the present authors to incorporate clips from episodes of the *Three Stooges* for data collection and hypothesis testing exercises in their classes. The stooges provide comic relief for those who enjoy slapstick humor, but also addresses serious issues, given the proclivity of the stooges in perpetrating violence in the media. Students engage in such exercises as counting "violent acts" in preparation for testing hypotheses with a *t*-test or other statistic and assessing changes in levels of screen violence across the nearly 50 years that the stooges produced films. This particular strategy for contending with student D.RA.MA will be shared as its uses are assessed.

Within criminal justice and criminology, it is essential, unfortunate as it may be, for the professor charged with delivering research methods or statistics classes to explain its relevance in the career field. Students need to understand that these are fundamental tools for assessing agency policies, that most of the criminological literature they will consume as they absorb from the knowledge base of the field is generated through the practice of research and that statistical literacy is essential for study beyond the bachelor's degree level. One of the present authors routinely shares with students stories of alumni making contact years after completing a research class. Many of these belated contacts express surprise and bemoan the predicament of being assigned a research project in their current position in a criminal justice agency. The irony that is explained to current students is that some of these alumni regret that they failed to grasp the importance and relevance of the material while in school.

Connecting with D.RA.MA-plagued students is a challenge and will continue to be for the foreseeable criminological future. Identifying a combination of strategies to attenuate it will result in more effective teaching and learning. It will be necessary to continue to experiment with ways of communicating course relevance, offer assurances for those experiencing math anxiety, and to develop

novel instructional approaches that incorporate popular culture, humor, and other platforms for combating statistical disinterest.

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