Manual for the Students' *Thinking about Majors Scale* (*TAMS*)

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If possible, would appreciate if you shared with us data from the TAMS from any larger data sets (e.g., N >100) and/or special populations.

Introduction
The *Thinking about Major Scale* was developed to assess the decision process undertaken by college students to identify a major to pursue. Although prior research has described factors that influence students' choice of a college major, there existed no formal, validated measure of students' process of selecting a college major. The TAMS was developed to fill this gap.

Development of the TAMS

To develop an initial measure of the TAMS, the first author reviewed existing literature on students' process and outcomes of selecting a major and identified eleven categories of thinking about majors; these are indicated in Table 1. Concurrently, she conducted an initial pilot study in which she interviewed 20 college students. From notes and recordings of the interviews, the authors then developed 168 potential survey items. The eleven areas were developed to ensure wide and comprehensive content representation and to organize the items initially. The authors did not expect that the final scale's covariance structure would correspond to the same eleven categories.

Table 1: Students' Areas of Reasoning About their Major.

Name of Category	Description
Choice Exploration	The degree to which students engage in thoughtful exploration of the options of major available to them including exposure to different options and examination of the benefits and drawback of the major
Confidence	The level of confidence students have in their ability to perform well in the major
Commitment, Persistence, and Focus	The amount of commitment students feel toward their major; how much they are willing to work through challenges and obstacles to be successful
Personal Growth	The role of reflection and introspection leading to psychological growth that is associated with their pursuit of a major
Extrinsic–Intrinsic Motivation I: Valuing the Content	How much and the relative importance students place on the inherent joy derived from the major
Extrinsic–Intrinsic Motivation II: Autonomy Afforded by the Major	The degree to which students feel in control of their own work and their academic path as a student in the major
Extrinsic–Intrinsic Motivation III: External Pressures v. Autonomous Decision-Making and Autonomous Support	The level of support students receive from others in making the choice of major for themselves (rather than pressure to choose a major to meet the expectations or wishes of others)
External Rewards	The role of potential benefits (e.g., salary, prestige) in directing students' choice of major
Fit with Other Plans	How the major is related to students' other long-term goals or if it allows students the opportunity to pursue other interests
Matching People and Interests	How well students' own interests and personalities are aligned with their classmates within the major
Fit with Self	How well students' own interests and personalities are aligned with the characteristics and expectations of the major

We reviewed the initial list of 168 items and selected a final set of 79 items based on the inclusion criteria that the statement (a) was clear enough to be interpretable, (b) appeared relatively central to the decision process of choosing a major, and (c) provided unique content. To promote diversity in category content, we ensured that at least four items remained in each category. These final 79-items formed the initial TAMS item set.

Sources of Data. Initial data analyses were conducted across two studies. The Study 1 was comprised of two samples: a university student sample collected at the University of New Hampshire ($N = 319$) and a second sample of students currently enrolled in an undergraduate college/university collected through Mechanical Turk ($N = 471$). Study 2 relied on a single sample collected through the Psychology participant pool at the University of New Hampshire ($N = 487$).

Exploratory Factor Analyses. To obtain an initial sense of the item structure, we employed an exploratory factor analysis (EFA) on the 79 items in Mplus Version 7.4 (Muthén & Muthén, 2015). Following convention, we sought to obtain a comparative fit index (CFI) and Tucker-Lewis Index (TLI) values "near .95" (Bentler & Bonnett, 1980; Marsh, Hau, & Wen, 2004; Yu, 2002) and a Root Mean Square Error of Approximation (RMSEA), of less than .08 (Schreiber, Nora, Stage, Barlow, & King, 2006). We were aware, that large item sets by their nature are challenging to fit to factor models and many items are likely to underperform and some compromise as to criteria were likely be necessary (DeVellis, 2017; Little, Cunningham, Shahar, & Widaman, 2002). Following relevant recommendations, we therefore eliminated items that failed to load at least as high as $r = .50$ on their primary factor and/or that exhibited loadings that exceeded $r = .20$ on two or more factors, as that reflected a lack of discrimination across factors (see DiStefano, Zhu, & Mindrila, 2009; Matsunaga, 2010; Yong & Pearce, 2013). After applying our criteria, only the 1- and 2-factor solutions appeared viable; the rest all contained factors with fewer than three items. Fit statistics are presented in Table 2. We defer discussion of the factors meaning until after the confirmatory factor analysis section next.

Table 2: EFA and CFA Fit Statistics.

		χ^2	CFI	TLI	RMSEA
EFA: 1-factor solution	Study 1	12118.14	.823	.819	.062
EFA: 2-factor solution	Study 1	10210.97	.859	.851	.056
CFA: 1-factor solution	Study 1	4960.60	.904	.900	.071
CFA: 2-factor solution	Study 1	669.90	.951	.945	.061
	Study 2	659.92	.932	.923	.077

Confirmatory Factor Analyses. We next used results from the exploratory solutions to confirm a simple factor structure using a CFA for the 1- and 2-factor models using items that met our criteria (i.e., constraining each item to load only on its highest factor). The revised scales exhibited better fits than those obtained through the initial EFA. Fit statistics are presented in Table 2. Fit statistics were replicated for the 2-factor solution in a second independent sample. Although the fit was marginally lower, it still represented an acceptable fit for a scale of its kind.

Factor Interpretation. Given the markedly better fit values for the 2-factor model, we proceeded to interpret the 2-factor model. The items of the 2-factor model and their loadings are indicated in Table 3 (middle columns). We labeled Factor 1 "Thought Avoidance" because its 11 items reflected students' aversion to engaging in a thoughtful decision process: i.e., "I don't want the responsibility of choosing my major, I'd rather have someone else tell me what to choose," and "I picked a major without giving it much thought." We labeled Factor 2 "Appraised Match" because its eight items described students' thoughtful reflection on how the major fit with their interests, goals, and perceived abilities: i.e., "I feel a sense of satisfaction in my work with this major" and "this major will allow me to be successful in my later life."

Across two samples, the two factors correlate negatively with one another ($r = -.46$ in Study 1, and $r = -.53$ in Study 2). Descriptive and reliability statistics are presented in Table 4.

Table 3: CFA Factor Loadings for the TAMS

Item	Study 1		Study 2	
	Factor 1: Thought Avoidance	Factor 2: Appraised Match	Factor 1: Thought Avoidance	Factor 2: Appraised Match
1. I don't want the responsibility of choosing my major; I'd rather have someone else tell me what to choose	.83		.82	
2. It's better to just let others select a major that would be good for me.	.82		.81	
3. I picked a major without giving it much thought.	.71		.70	
4. I'm not ready to select a major yet.	.70		.77	
5. I need to work on my personality to better fit my major.	.66		.62	
6. This major makes me feel like I am escaping who I am.	.63		.62	
7. I chose this major to please other people.	.62		.58	
8. I struggle with tasks in the major.	.61		.60	
9. I feel "micro-managed" in many aspects of my current major.	.52		.38	
10. It is more important that I make a lot of money than to enjoy what I do.	.52		.50	
11. This major requires too great of a time commitment than I can or am willing to meet.	.48		.53	
12. I like the level of interaction with others involved in this major.		.68		.69
13. This major has helped me to cultivate new skills.		.67		.59
14. I share common goals with my classmates in courses related to my major.		.65		.63
15. This major will allow me to be successful in my later life.		.65		.68
16. I'm sticking with this major even though it's hard because I love this major.		.65		.65

17. I like my classmates in this major.	.62	.67
18. I like the level of challenge presented by my major.	.62	.64
19. This major makes me a better person	.58	.67
20. This major provides the most practical or realistic plan for my future.	.54	.65

Note. In simple structure CFA, items are constrained to one factor; loadings for the alternate factors are constrained to zero and to indicate that, those values set to zero are left blank in the table.

Table 4: Descriptive Statistics and Cronbach Alpha Reliabilities

	Study 1			Study 2	
	M (*SD*)	Reliability		*M* (*SD*)	Reliability
		α	marginal (IRT)		α
TAMS: Thought Avoidance	1.85 (0.46)	.84	.86	1.95 (0.39)	.83
TAMS: Appraised Match	3.13 (0.38)	.79	.81	3.04 (0.35)	.80

Note. Means presented in this table reflect a 1 to 4 Likert scale.

Evaluation in an Item Response Theory (IRT) Model. We also examined the two factors individually using a two-parameter item response theory model to assess to assess the quality of the two individual factor scales using IRTPro (Cai, Thissen, & du Toit, 2011). IRT has the advantage of allowing us to further check the item discrimination and difficulty range of questions on the test that were retained. The IRT analyses indicated that Thought Avoidance contained items with discrimination slopes between 1.08 and 3.01 (values below about .35 are problematic); and between 1.12 and 1.80 for Appraised Match. In IRT difficulty levels are measured on an adjusted probability-like scale similar to z-scores with a typical range of -3 to 3. Items on the Thought Avoidance scale ranged in difficulty from -1.48 to 3.66 and those on the Appraised Match scale, from -5.19 to 1.37, indicating that our items represented a good range of difficulty levels. RMSEA values were .06 for both the Avoidance and Match scales; the marginal reliabilities were good at .86 for Avoidance and .81 for Match.

Administering and Scoring the TAMS

This first version of the TAMS was administered using a 4-point ~~or a 5-point Likert~~ scale ranging from Strongly Disagree to Strongly Agree. Data presented above reflects the 4-point scale administration. Averages are computed for each subscale. No items are reverse-scored. [If you want: Subsequent administrations have moved to a 5-point response scale; data for those administrations are forthcoming in a subsequent edition of this document]

Conclusions

The TAMS represents a method of assessing how students chose (or are choosing) their major. Some discussion of the scale development and its basic psychometrics are outlined in this document. The TAMS validities will be reported in subsequent papers.