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Major Decisions: Personal Intelligence and Students' Reasoning about College Majors

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MAJOR DECISIONS:
PERSONAL INTELLIGENCE AND STUDENTS' REASONING ABOUT COLLEGE
MAJORS

BY

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DISSERTATION

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ABSTRACT

MAJOR DECISIONS:
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Kateryna M. Sylaska

University of New Hampshire, May, 2016

Researchers and universities have devoted substantial resources to understanding college students' experiences in college. One gap in the literature surrounds understanding students' major selection process. In the current series of studies, I utilized previous research and semi-structured interviews to create the Students' Reasoning about their Major Survey (RAMS). I conducted exploratory and confirmatory factor analyses on the items in two distinct samples and found a general factor (Satisfaction with the Major) and seven secondary factors (Balance and Flexibility, Prestige, Interpersonal Similarity, Effort and Difficulty, Interest, Perceived Competence, and Decision Aversion). I hypothesized that the RAMS would be related to personal intelligence (i.e., students' ability to reason about their own and others' personality and to use this information to guide their choices; Mayer, 2008); and indeed, students with higher levels of personal intelligence exhibited clear signs of making well-reasoned decisions relative to those with lower personal intelligence. The RAMS, personal intelligence, and other psychological variables predicted several academic and advising outcomes. Students who had made a well-reasoned choice of major had higher GPA, higher levels of commitment to their major (e.g., fewer absences in courses for their major, less consideration of changing their major)

and engaged in more preparation for their advising appointment. The series of studies presented here support the development and use of the RAMS to measure students' reasoning about their major, and may be helpful in predicting students' academic success and commitment.

Chapter 1

Introduction

Over one-quarter of all 18 to 24 year olds in the United States are enrolled at a four-year college or university according to the National Center for Education Statistics (NCES, 2013). We know that young adults within this age range, who psychologists often refer to as emerging adults, are engaged in a process of identity exploration and forming models of the self (Arnett, 2000). Educational institutions provide the context for many young adults' pursuit of self-knowledge at this age. Young adults also use what self-knowledge they develop for practical purposes: for example, to select a college major that suits them.

The average student considers nearly five majors, uses nearly six criteria in evaluating their options, such as career opportunities or interest, and consults an average of 2.59 information sources (e.g., talking to their parents) in working through their options (Galotti, Ciner, Altenbaumer, Geerts, Rupp, & Woulfe, 2006). Although students decide on a major early in their college careers, their first choice is not always the best choice for them in the long run, or so it seems. Between one-third and one-half of students change their major at least once during their college career (Beggs, Bantham, & Taylor, 2008; Feldman, Smart, & Ethington, 1999; Malgwi, Howe & Burnaby, 2005). It appears that, over time, students are problem-solving about how a potential major might fit their current and future identity and social roles (Arnett, 2014; e.g., Syed, 2010).

Personal Intelligence Framework

Students increase their self-knowledge by exploring possible identities (e.g., English

major), and through such exploration, increase their self-knowledge. One explanation for how students reason with this knowledge is that they use an intelligence. Personal intelligence refers to an individual's ability to reason about her own and others' personalities and to use personality-based information to guide her thoughts and behavior (Mayer, 2008).

Personal intelligence theory describes four areas of problem solving in the realm of understanding both one's own and others' personalities:

(a) to recognize personally relevant information from introspection and from observing oneself and others, (b) to form that information into accurate models of personality, (c) to guide one's choices by using personality information where relevant, and (d) to systematize one's goals, plans, and life stories for good outcomes.

(Mayer, 2008, p. 215)

Using the personal intelligence model, I will frame my approach to understanding students' choice of major in terms of these four areas of reasoning.

Consider the case of a hypothetical student, Tyler. First, students like Tyler must recognize information about their own personalities and personally-relevant information about other students. Tyler has learned that he enjoys watching foreign language films (through self-observation), is able to pick up language quickly (feedback received on tests and assignments in French class), values creativity and feels content when he has the freedom to express his emotions through art (introspection). Tyler uses these same methods to consider information about his classmates in his courses. When choosing a major, he may observe that his classmates in his French class are likewise mostly outgoing and interested in trying new things (e.g., exploring new cuisines).

Second, students will use the information they have gathered to form accurate models of their own personalities, and the typical personality of a student within a specific major. Tyler may see himself as a creative and artistic-minded person. Simultaneously, he may construct models of personality for students in different majors: that art majors are creative and extroverted, and that social science majors are more open to experience than engineers (Balsamo, Lauriola, & Saggino, 2012; DeFruyt & Mervielde, 1996). Tyler may realize that he fits in better with language and arts students than with marketing or biology students. That insight might lead him to major in French.

Having chosen a major, students set personal and academic goals relevant to their major and their life plans. Tyler may intend to study abroad in France his junior year. To achieve this, he will likely set additional goals for himself such as “to attend French club each week without speaking English,” and “to earn at least a B in all courses.” Tyler is more likely to study abroad and enjoy the first-hand experience of living in another cultural environment if he maintains a high GPA, is engaged in activities and clubs, and is satisfied with his overall college experience—outcomes that his plans promote. Positive outcomes follow personally-intelligent goal setting (Mayer, 2008).

Personal Intelligence as an Individual Difference Variable

Some students are better at reasoning about personality than others. These students will be at an advantage because they can identify a major that fits with their own personality. In contrast, students who are less personally intelligent are more likely to base their choice of major on less accurate information. Consider the contrasting case of Tyler’s classmate Anna who already had chosen to major in psychology; Anna failed to recognize that she was not very interested in her psychology courses, and as a consequence failed to explore majors that might

better fit her interests in writing for the school newspaper (e.g., journalism, communication). As a consequence, she ended up performing poorly in her social psychology class, and did worse in statistics; she became detached from the subject matter of her major.

Mayer (2014) connected the theory of personal intelligence to a several key personal qualities investigated by contemporary researchers. He argued that personal intelligence would be higher among people who are, on the whole, characterized by greater intrinsic motivation in carrying out projects (e.g., Ryan & Deci, 2000), who develop a clear identity (e.g., Marcia, 1966), who set goals that are low in conflict (e.g., Emmons & King, 1988), who match themselves to situations (e.g., Armstrong, Day, McVay, & Rounds, 2008; Sherman, Nave, & Funder, 2010; 2012), and who are relatively engaged in future planning (e.g., Ersner-Hershfield, Garton, Ballard, Samanez-Larkin, & Knutson, 2009). These reasoning processes are related to choosing a college major as well.

My application of personal intelligence to students' choice of major rests on several assumptions. First, the model assumes that students' personalities differ across major; for example, that students who major in psychology have different personality traits on average than journalism majors. Second, the model assumes that students vary in their ability to recognize personality relevant information about themselves and their classmates. As we saw with the hypothetical students described above, Anna failed to recognize the dissimilarity between her own personality and the personalities of her psychology classmates; by contrast, Tyler recognized his similarity with his art and French classmates.

Looking Ahead

In the next few chapters, I review the literature on how students choose a major. In the next chapter (Chapter 2) I will provide an overview of how I identified relevant domains in

research literature and examined how students' personalities differ across major. In Chapter 3 I will review how students perceived the influences on their choice of major, and in Chapter 4 I investigate the outcomes associated with students' choice of major, and if making a personally intelligent decision is related to positive outcomes. In Chapter 5 I will introduce the plan for my current research, which I discuss in detail in Chapters 6 through 9. Finally, Chapter 10 contains a general discussion of the findings and their implications.

Chapter 2

The Role of Personality in Students' Choice of Major

Given the social, personal, and economic pressures on students, as outlined in Chapter 1, researchers have sought to answer how students identify a major in which they can be successful. As a beginning to my own work, I collected and synthesized some of this information using the personal intelligence framework described in Chapter 1. My focus was on the role personality might or might not play in major choice.

Our Approach to Classifying the Research

To identify relevant literature, I searched multiple databases (i.e., PsychInfo, Academic Search Complete, Education Source, ERIC, Project Muse) for information about college students' choice of major. In order to identify literature about how personality contributes to students' major choice, I used the keywords "personality," "major," and "choice" in my search across all years of publication.¹ I was able to divide the search results into three areas of research: how personality varies across majors, how students choose their major, and how choice of personality congruent major relates to academic outcomes.

In the first area, researchers examine how students' personalities differ across major. For example, DeFruyt and Mervielde (1996) assessed the personality characteristics of college seniors and found that history majors were high in the trait of neuroticism, but low in the traits of extraversion and conscientiousness. Researchers in the second area examine reasons that students provide for selecting their major. For example, Soria and Stebleton (2013) found that the

¹ Without specifically including personality in my search, research focuses more on sex/gender differences in choice of major, particularly in STEM-relevant domains (e.g., Science, Mathematics).

majority of students were influenced by their interest in the subject area of the major, their own intellectual curiosity, and believed their major would prepare them for a fulfilling career. In the third area, researchers have explored whether students' who choose a major that is similar to their interests and strengths have greater academic success than those who do not.

My identification of three research areas is similar to the divisions recognized by earlier reviewers. Beggs, Bantham, and Taylor (2008) identified two research areas: the relation between "specific individual demographics and major choice"—and seemed to include personality qualities within 'individual demographics' (p. 382); and, as their second area, factors influencing students' choice of major. My three-area classification adds the study of the match between one's personality to a major, which was absent from Beggs and colleagues' two-area classification.

Personality and Choice of Major

I begin by turning our attention to the first area identified by my initial search—whether students' personalities differ across choice of major. The personal intelligence model assumes that personalities are relevant to major choice—that is, that people in different majors have different personalities. People commonly talk about the personalities of people in a given occupation—the argumentativeness of the pre-law student, the cool rationality of the engineer, and the emotionality of the arts student. Research bears out these conceptions—at least in part.

Majors and Holland types. Research has long-supported that specific occupations and specific majors vary on personality-relevant dimensions (e.g., Holland 1966; 1997). Holland distinguished among personalities who have interests that are: (a) realistic, (b) investigative, (c) artistic, (d) social, (e) enterprising, and (f) conventional. For example, realistic interests focus on mechanical objects and concrete tasks; on a questionnaire, a sample item would ask participants

how much interest they would have in building furniture.² Alternatively, investigative interests focus on the observational and systematic pursuit of knowledge; a student with strong investigative interests would likely endorse the item assessing their interest in using a microscope or other lab equipment. Several commonly used self-report measures are based on Holland's theory, including Self-Directed Search, the Unisex edition of the ACT Interest Inventory, and the Strong-Campbell Interest Inventory. Using those measures, researchers have found that, for example, engineering students are high in realistic and investigative interests, but low in social interests. In contrast, psychology majors are high in social, but low in artistic and conventional interests (DeFruyt & Mervielde, 1996; Harton & Lyons, 2003; Pringle, DuBose, & Yankey, 2010).

Majors and personality traits. A second line of research that makes the same point has employed measures related to the Five Factor Model. The Five Factor Model refers to five personality dimensions—*extroversion*, *openness*, *agreeableness*, *neuroticism*, and *conscientiousness*—that classify the majority of personality traits found in the everyday lexicon (Costa & McCrae, 1992; Digman & Inouye, 1986; McCrae & Costa, 1997). Additional personality traits not in the Five Factor Model also have been explored by researchers including conformity, empathy, impulsiveness, achievement motivation, and self-monitoring (e.g., Corulla & Coghill, 1991; Harris, 1993).

Most studies find differences in personality between students majoring in different areas; and these differences often seem to fit our intuitive ideas about students in the majors. For instance, researchers (DeFruyt & Mervielde, 1996; Larson, Wu, Bailey, Borgen, & Gasser, 2010) have found that arts and humanities majors are higher in neuroticism than social sciences majors;

² Example interests are taken from the UNIACT-S (ACT, 2009).

whereas social sciences majors are higher in extraversion and conscientiousness than arts and humanities majors.

Methodological Challenges

Ideally, to answer the question of how personality traits vary by major, I would create a matrix to summarize the literature with college majors listed across the top and personality traits along the left side so that each cell represented the intersection of a trait by a major and the trait profile of each major could be described. However, a number of obstacles prevent the completion of such a matrix.

One problem is the large number of possible majors. For example, here at the University of New Hampshire, students are offered nearly 100 majors; whereas across the state at Dartmouth College, students are offered a somewhat different set of nearly 60 majors. Dartmouth College offers a Native American Studies major not available at the University of New Hampshire; whereas the University of New Hampshire offers majors, such as Athletic Training, not available at Dartmouth College. Moreover, the naming of majors varies across universities—the University of New Hampshire offers a Communication major, whereas Dartmouth College offers Film and Media Studies, which is partly but not wholly equivalent. As a result, the columns of the hypothetical table I might construct—the majors—are both numerous and hard to match across institutions.³

The ideal table, in other words, cannot be constructed easily, and even if it could, most of its cells would be empty because most of the comparisons between individual pairs of majors have not been made. That said, majors have been compared with one another on various

³ One possible solution to this problem involves the conversion of majors to the National Center for Education Statistics' Classification of Instructional Program (CIP) codes to facilitate cross-college comparison, but this solution is not without limitations and largely is not employed by researchers at this time.

personality qualities; and although the comparisons are, as a group, unsystematic in their coverage of majors across the range of personality traits, there do appear to be differences in personality across majors, as the above findings indicate.

Conclusion

There is considerable support that personalities do indeed differ across majors, even given the research issues described in this chapter. In the next chapter I will explore how students identify the major that will be a good fit for them.

Chapter 3

Systematic Review of “Why Students Choose their Majors”

How do Students Identify Their Major?

How do students choose their majors? A number of studies examined this question, but often using different surveys and with somewhat different results. To integrate these works, I first identified a set of relevant studies.

Identifying Empirical Studies Related to Students’ Major Choice

To do so, I performed a literature search to find research relevant to students’ reasons for selecting their major through September 15, 2015 (a cut-off date set at the outset of this work). I reviewed all published articles written in English. I used “college majors” with one or more of the following: “choice,” “interest,” “motivation,” “influence,” or “decision making” as my search terms, identifying an initial group of 144 articles from the following databases: Academic Search Complete, Business Source Premier, Education Source, ERIC, and PsychINFO.

Criteria for inclusion and exclusion. I included all articles that represented original empirical research (quantitative, qualitative, and mixed methodologies were included) assessing students’ self-reported reasons for choosing a major. To be included, studies were required to (a) represent original empirical work concerning a student’s major; (b) ask students about the reasons for their choice of major; and (c) report results in terms of specific endorsements for choosing a major, with more than one option (at least one study asked about only one reason).

From my initial pool of 144 articles, I selected 23 unique studies based on these inclusion criteria; The 121 excluded studies consisted of 40 duplicates, three that did not report any

original research findings, 14 that did not concern students' choice of major, 61 that failed to discuss students' specific reasons for their choice of major, and three that collapsed research findings across major choice without presenting any major-specific data. From the 23 articles that remained, I identified another five relevant articles by examining reference lists of obtained articles. Thus, the final sample contained 28 articles. I will refer to a set of representative articles in the discussion that follows to convey the nature of these studies.

Combining Study Results

Identifying a common list of reasons from the studies. For the most part, researchers assessed students' reasons by presenting participants with a list of researcher-developed items (e.g., interest in subject, recommendation by family member). Sample lists of these reasons from previous research are included for reference in Appendix A. I compiled these reasons into a single list, removing duplicates or near duplicates. For example, "interest in major" "I am interested in this type of work" and "major-related interest" were combined into a single reason on my list—Interest in Subject Matter. The left column of Table 3-1 displays the integrated list of reasons students cite for selecting a major across studies.

Developing a common response metric. For the majority of studies, participants indicated the degree to which they were influenced by each reason on the list. The studies varied according to the type of response scale employed. Some studies used Likert-type scales of between 4 and 7 alternatives. Another group of studies allowed participants to respond by "selecting all that apply."

I next devised a method of quantifying the findings in this area using a common metric that equally represented alternatives from each study, regardless of how many reasons were included in the original study. Across studies, the listed reasons from which students chose

ranged from six to 37 (median reasons 11)⁴, Because the shortest list length was six, using the highest and lowest three would be a small enough figure to capture the shortest list and still capture the most and least important reasons on the longer lists. For that reason, I set the metric to denote the highest rated three items and the lowest rated three items universally across studies. Finally, I coded all the reasons according to whether they fell in the top three reasons for selecting a specific major (1), the bottom three reasons for selecting a specific major (-1), or in the middle (0). This criterion prioritizes being inclusive of multiple studies; its drawback is that it reduces information collected about mid-level rankings of majors, which I considered a reasonable tradeoff to be inclusive of all studies.

Five most endorsed reasons. Using this method and combining across 10 representative studies, the first five rows of Table 3-1 display the top five most endorsed reasons in descending order. The students' top five reasons for choosing a major were: (a) interest in subject, (b) enjoy learning in area, (c) job prospects, (d) wanting a career associated with the major, and (e) preparation for future goals. "Interest in the subject" was in the top three highest rated reasons in every study that included it. Additional student-endorsed reasons for pursuing their major were students' enjoyment of learning in the area, their belief that job prospects would be good following graduation with the major, and that students desired a career associated with a given major (e.g., DeMarie & Aloise-Young, 2003; Marrs, Barb, & Ruggiero, 2007).

Six least endorsed reasons. In contrast, as shown in the last six rows of Table 3-1, students report being least influenced by parents or other family members, academic personnel (e.g., advisors, teachers/professors, guidance counselors), the difficulty of the major, promotional

⁴ I employed the median in my decision rather than the mean ($M = 13.8$; $SD = 8.87$) because the upper limit of the range (i.e., 37 items) was an outlier; the next highest value was 19, with most lists using between 10 and 12 items.

materials or open house sessions, expected earnings, and the influence of peers. In fact, for all studies that included these in their list of reasons, they were among the lowest three endorsed reasons for pursuing a major (e.g., Kim, Markham, & Cangelosi, 2002; Malgwi, Howe, & Burnaby, 2005).

Neither high nor low reasons. Other reasons explored by previous research include students' aspiration for increased self-knowledge, expected earnings for graduates of a given major, and students' previous coursework or experiences related to the major. Some of these mid-range reasons were explored in only one study and may represent motives specific to a particular major, such as "helping others" or "liking children" for education majors (DeMarie & Aloise-Young, 2003). However, the majority of these otherwise mid-level reasons have been examined within several studies, but consistently fell at neither extreme, but in the middle: between the top three or bottom three reasons, such as "background in previous coursework and previous experience," "reputation of the major/university," or the quality of the education."⁵ A complete list of these midlevel reasons is presented in Table 3-1.

Conclusion

This extensive research literature reveals the underlying complexity of how students are influenced in selecting their college major. It is clear that students are influenced by several factors as they select a major. Among these many factors, I found that students are particularly influenced by their own interest in the subject and how the major will prepare them to meet their future goals.

In the next chapter, I will present research relevant to the final area—the importance of students' congruent choice of major.

⁵ Researchers have rarely explored other reasons such as self-efficacy, not being able to get into one's first choice of major, or having time for other activities.

Chapter 4

Why Does a Student's Choice of Personally-Congruent Major Matter?

A student's major is congruent when the subject matter of the major matches the student's interest and abilities in tasks related to major content. When students choose majors congruent with their personalities, are they more successful than students who choose incongruent majors? Through a review of an extensive body of prior research on the topic, I identified several outcomes associated with a good choice of major: (a) academic performance, (b) subjective satisfaction with their education, and (c) persistence and commitment toward their education.

The majority of outcome-focused research has assessed outcomes as a function of interest-major congruence in the tradition of Holland's interest types (Holland, 1966; 1997).⁶ Students with preferences consistent with one type (e.g., social) are more likely to select into a major with a similar Holland profile (e.g., psychology). For these studies, a major is labeled congruent if a student's self-reported interest profile—their actual or relative scores on Holland's six dimensions—aligns with the Holland profile for the major. For example, a student with an interest profile indicating that they have strong interests in the enterprising domain, low interests in the social domain, and a major in business administration (major profile is high in enterprising) would be in a congruent major. If that same student selected a major in philosophy

⁶ A handful of other studies have assessed outcomes by students' major without considering congruence. Researchers of these studies primarily measure outcomes such as post-academic plans and success. For example, Goyette and Mullen (2006) found that arts & sciences majors were more likely to attend graduate school, whereas vocational majors were more likely to work full time following college (especially business majors) and to earn more immediately following graduation (particularly business and engineering majors).

(major profile high in social), the major choice would be incongruent. Table 4-1 presents key findings from studies examining outcomes of students' congruent choice of major.

Academic Performance

Research consistently reports that increased congruence is correlated with higher GPA; however, regression-based findings vary by study (Allen & Robbins, 2010; Schmitt, Oswald, Friede, Imus, & Merritt, 2008; Tracey, Allen, & Robbins, 2012; Wessel, Ryan, & Oswald, 2008). Whenever the effect of congruence is significant in regressions, it is always in the positive direction, indicating that interest-major congruence is related, through direct or indirect effects, to increases in GPA (Schmitt et al., 2008; Tracey et al., 2012; Tracey & Robbins, 2006; Wessel et al., 2008).

Satisfaction

The findings regarding congruence and college satisfaction are mixed. As summarized in the second row of Table 4-1, both Feldman, Smart, and Ethington (2004) and Wessel and colleagues (2008) found that congruence did not influence academic satisfaction (e.g., quality of instruction), was unrelated to satisfaction with career counseling and advising, and unrelated to institutional satisfaction (e.g., confidence in choice of university and feelings of belongingness). By contrast, Schmitt and colleagues (2008) and Eun, Sohn, & Lee (2013) identified interest-major congruence as a strong and positive predictor of academic satisfaction.

Persistence and Commitment to Major

Findings are more consistent between congruence and students' academic commitment, persistence, and focus (as shown in row three of Table 4-1). Regarding students' persistence in their major, Wessel et al. (2008) did not find an effect of congruence on students' self-reported likelihood of changing their major in the next year; however, Tracey and colleagues (2006;

2012) found that congruence was associated with greater persistence in the major when students had less interest and when there was little variability between the student and their classmates in the major.

Regarding persistence to degree completion, researchers consistently find that students who have a congruent major intended to remain at their university, feel like they should stay in their major, and complete their degree on time (Allen & Robbins, 2010; Schmitt et al., 2008; Wessel et al., 2008). For Schmitt and colleagues (2008), this effect was mediated by satisfaction with the institution.

Regarding more proximal indicators of academic commitment, such as class attendance there is little support for the role of congruence (Wessel et al., 2008). By contrast, Schmitt et al., (2008) identified a significant indirect effect; that is, students with congruent majors were more satisfied with academics at the institution, which in turn was associated with fewer absences from classes.

Why Aren't Findings Uniformly Positive? Students are Shaped by Their Majors

In a series of articles, Feldman and colleagues (Feldman, Ethington, & Smart, 2001; Feldman et al., 1999; 2004) used institutional data to examine the interests and abilities of students in their first year of college and again four years later. They found that students' abilities and interests increased in their selected major (regardless of congruent choice) and showed little or no decrease in ability and interest in their originally congruent domains. These patterns indicate a socialization dynamic at work: Students' abilities and interests shift towards those emphasized in their chosen major—at least for those who stick with the major. However, initial interests and abilities do confer additional benefit when students select a congruent major by providing a higher starting point.

Conclusion

Taken together, studies examining outcomes of students' choice of major indicate that congruence improves educational experiences, especially commitment and persistence toward degree at the university. Using personal intelligence to understand yourself, to understand other people you will work with, and what you like contributes to positive outcomes. In the next chapter I will discuss how this existing research guides the current research.

Chapter 5

Current Research

The current research project represented my attempt to understand students' decision process of selecting a major and to examine the correlates and outcomes of students' choice of major. I was particularly interested in exploring the role of students' accurate knowledge of themselves and others in deciding on their major.

In the previous three chapters, I established that (a) students' personalities do indeed vary across majors, (b) students report being influenced by multiple factors in selecting a major, and (c) congruence between a student's personality and major is associated consistently with increased commitment to her educational pursuits. The current research project examined whether students' personal intelligence—the ability to reason better about personality—lead to a more optimal choice of major.

Research Goals

To explore this topic, I: 1) examined the relation between students' personal intelligence and their reasoning for selecting a major. Most centrally, 2) I developed and evaluated a measure of students' reasoning about their major (the RAMS), which can be thought of as a proximal measure of how personal intelligence is applied in the thinking process leading to a choice of major, and 3) explored how the measures of personal intelligence and reasoning about major correlated with students' academic outcomes.

Overview of the Research

In The Preliminary Study, I conducted semi-structured interviews with the goal of

exploring students' own articulation of how they reasoned about possible majors. Based on the work of prior researchers, and the results of The Preliminary Study, I wrote items assessing students' choice of major. In Study 1, I developed a measure of reasoning about major choice from those items, and used that measure, along with a measure of personal intelligence, to evaluate students' academic outcomes. Study 2 provides a replication and extension of Study 1.

Chapter 6

Preliminary Study: A Preliminary Exploration into Students' Choice of Major

There existed no formal, validated measure of students' process of selecting a college major. To explore students' thinking with the aim of developing a measure that reflected their experiences (also basing that measure on the work of other psychological theorists), I conducted semi-structured qualitative interviews with students in February and March of 2015.

Method

Participants

Participants included 20 students participating in research through the UNH psychology department research subject pool. They were drawn from the College of Engineering and Physical Sciences, College of Health and Human Services, College of Liberal Arts, College of Life Sciences and Agriculture, and the College of Business and Economics at the University of New Hampshire. Given the small sample, I do not present any other potentially identifying information about participants.

Procedure

Students were recruited through the University of New Hampshire psychology department participant pool, for a study advertised as "Major Decisions: College Students' Academic Choices." Participants were given one course credit in exchange for their participation.

Participants arrived at the researcher's laboratory, were provided with informed consent, and were interviewed. The author employed a semi-structured interview of 17 questions. Sample

questions included: “What signs did you see that you were close to deciding on your major?” and “Are others supportive of your choice of major?” A full list of the guiding questions used for the semi-structured interviews are included in Appendix B. All interviews were recorded with participant consent. Following the interview, they were given a debriefing form.

Results and Discussion

I extracted themes appearing across participants drawing on a grounded theory approach (e.g., Charmaz, 2014; Corbin & Strauss, 2008) and used these themes to develop questions for the survey used in subsequent research. From these interviews I observed that students were often highly insightful about the influences on their choice of major, the complex interplay of these influences, and the overall trajectory of their decision—a trajectory which often began during high school.

For example, I noticed that participants entered the university with varying knowledge of what would later become their major. One participant noted that “I actually had no idea what [my major] even was before I came here ... I knew nothing.” Another participant had a very different experience, stating “I took [a class related to major] in high school and I really liked it. I don’t know, I just think it’s really interesting ... by the time senior year [of high school] came around, I was just really set on [major].”

Several students also commented on the role that other figures in their life had on their choice of major. Some of these figures were very supportive of their process of deciding, others provided a model for what a career with a major would be like, and others reported pressure from family members. A few examples of these reactions follow: “So when I was a senior [in high school] I went out and job shadowed my aunt [in field related to major] ... just to give me a taste of everything,” “Ever since I was little I wanted to be in the [major-related] field, and my parents

really pushed it because there's always jobs available." Some students spoke about how others helped them to develop skills in the area:

In middle school I was really bad at [subject related to major] and one of my teachers ended up helping me and when I got to high school I had like one teacher who really helped me and was like always there to help me. So then like everything clicked and I became better at it, so I kind of wanted to like be that person for another student. ... I wanted to be a [subject] teacher.

I noticed that students' responses mapped well onto research about students' reasons for pursuing their major in several ways. For example, all students mentioned their interest in their major and how much they enjoyed classes related to their major in high school and in college. However, students' narratives also reflected themes that were not strongly represented by prior research. As shown through the quotes above, several students discussed the importance of their family members and academic mentors, such as an advisor or teacher, in exposing them to options that they had not considered or by modeling a career that would follow from a particular major.

I explored the content of the themes discrepant between the interviews and previous research and developed items to assess both the overlap and the differences. For instance, earlier research asked about pressure from parents and other authority figures. Students, however, often spoke about support rather than pressure from family members, and about finding role models in a field. These interviews, coupled with earlier research, helped inform the development of the scale of major choice described next.

Chapter 7

Development of the Reasoning About Major Survey

To develop the initial version of the Reasoning About Major Survey described in this chapter, I went through an iterative process to identify areas that students use to choose their majors. First, I drew on the theory of personal intelligence (Mayer, 2003), which describes intelligent reasoning about personality as including efforts to explore and develop one's identity (e.g., Arnett, 2010; Marcia, 1966), self-determined motives guiding behavior (e.g., Ryan & Deci, 2000), and perseverance towards one's goals (e.g., Duckworth, Matthews, & Kelly, 2007). These ideas were then related and contextualized to major choice by drawing on the reasons students give for selecting their majors (see Chapter 3 for review). To compose test items, for example, I drew on the language students used to describe their process in The Preliminary Study.

The item writing and organization process also led to further thinking, because it enabled me to see which self-evaluative statements turned out to be redundant, which aspects of students' reasoning did not quite fit with theories and needed their own categories, and which statements—despite being from different theories—were so similar that they could be combined. In the end, I concluded that, based on prior theorizing, research, and the interviews conducted for this research, students' thought processes regarding their major could be divided into an initial list of 11 categories—categories such as self-confidence, interest, and autonomy (see Table 7-1 for a list and brief description of each category). In the scale, each category was represented by four to ten items. For example, the confidence category is represented by the item “I believe that I will succeed at this major” and the valuing the content (or interest) category is represented by

the item “I am excited about this major.” Appendix C includes the 79-items I developed divided into the 11 categories.

Ten of the 11 categories are related to effective reasoning about personality, such as “what am I interested in?” and “can I do this?”. For that reason, personal intelligence can serve as a backdrop when considering the structure of the scale.⁷

⁷ Although an important aspect of students’ reasoning about their major, I do not believe that the External Rewards area is linked to students’ personal intelligence.

Chapter 8

Study 1: Personal Intelligence and Students' Choice of Major

Study 1 was designed to explore the Reasoning About Major Survey (RAMS), a measure of students' decision process for selecting a college major. The study is focused, first, on creating a mathematical model of the scale so as to optimize its performance; and second, on relating the scale and personal intelligence more generally, to key academic outcomes including GPA, absences, and withdrawal intentions.

Aims and Hypotheses

Scale development aims and hypotheses. In Study 1, I examined the factor structure of how students reason about their choice of major. Factors refer to meaningful subsets of items assessing a specific component of the larger construct assessed by the measure (Reise, Waller, & Comrey, 2000; Worthington & Whittaker, 2006). Based on prior research presented in The Preliminary Study and by other researchers, I hypothesized that the initial RAMS items would represent an individual difference scale modeled with a bifactor structure. Specifically, I hypothesize that the RAMS will demonstrate a factor structure including a general factor of "good decision process" and up to 11 distinct secondary factors representing specific aspects of students' reasoning about their major.

Correlational aims and hypotheses. Following development of the RAMS, and drawing on the personal intelligence framework, I hypothesized that personal intelligence would be related to the RAMS, and that both measures would correlate with students' GPA, their absences, withdrawal intentions, and the number of times they had changed their major.

Method

Participants

Participants were 683 college students obtained through two sampling strategies. In the first, students in the College of Liberal Arts from the College of Liberal Arts Dean's Office at the University of New Hampshire were recruited through e-mail ($n = 290$). In the second sampling strategy, students were recruited through Mechanical Turk ($n = 393$). Mechanical Turk is an online system hosted by Amazon in which individuals earn compensation for completing research studies posted through the website. Participants were required to be at least 18 years of age or older and currently attending a college or university.

Measures

Background information. I asked participants to provide basic demographic (i.e., sex, age, race/ethnicity) and background academic information (i.e., major, class rank). Descriptive statistics are presented in Table 8-1. The majority of participants identified as female (63%) and White (80%). Average age of participants was 22.81, ranging from 18 to 40. Participants represented students across the four years of college, and several majors—the most common majors were Psychology (12.9%), Undeclared major (11.9%), Business Administration (8.3%) and Communication (5.7%).

Reasoning About Major Survey (RAMS). The initial RAMS was an experimental 79-item survey assessing students' reasoning about selecting a major, using students' own language about their major selection process to create the items. Items fell into 11 a priori organized categories including Choice Exploration and Autonomy (see Table 7-1). For example, students' choice exploration is assessed by the item "I weighed out options by comparing my experiences in several classes before choosing this major." The full list of items is included in Appendix C

divided by category. Students indicated their level of agreement with each item on a four-point Likert scale ranging from 1 (*Strongly disagree*) to 4 (*Strongly agree*).

Test of Personal Intelligence-MINI-12. The Test of Personal Intelligence-MINI-12 (TOPI-MINI-12; Mayer, Panter, & Caruso, 2013) is a 12-item ability measure that gauges how accurately participants answer questions about personality. For example, an item might ask: “A person is straightforward and modest. Most likely, she could also be described as:” with response options: “*valuing ideas and beliefs*,” “*active and full of energy*,” “*sympathetic to others and tender minded*,” and “*self-conscious and more anxious than average*.” The correct answer is “*sympathetic to others and tender minded*” based on findings from previous research linking these personality attributes (sample item taken from Mayer, 2015). Participants selected the answer they believed was most correct from four choices; responses were coded as 1 (*correct*) or 0 (*incorrect*). The TOPI-MINI-12 is drawn from a longer test and was used here in the interest of survey time. The TOPI-MINI-12 yields a single score of personal intelligence, with higher scores indicating higher levels of ability in the area. Prior research has reported positive relations between personal intelligence and psychological mindedness, agreeableness, and conscientiousness in the range of $r = .15$ to $.35$ (Mayer et al., 2013). Split-half reliability for the current sample was $.68$, a value within the expected range for this very brief measure ($.53$ to $.84$; Mayer et al., 2013). Descriptive statistics for the TOPI-MINI-12 are presented in Table 8.5.

Academic Markers. Guided by previous research, I used 14-items to measure academic markers relevant to assessing the students’ well-chosen major. The questions inquired about students’ academic performance, timeline for selecting their major, commitment to their major, and intentions to remain at UNH. For example, to assess students’ commitment to their major, I asked “on average, how many hours per week do you spend studying/preparing for a course in

your major or intended/possible major?" (see Appendix D). Descriptive statistics for academic variables are presented in Table 8-5.

Attention Check. Seven attention-check items were included to ensure survey respondents were paying attention while answering the questions. Items asked questions such as: "To indicate that you are still paying attention to the survey, could you please select the third response of the four multiple-choice alternatives below?" This measure was only completed by participants recruited through Mechanical Turk.

Procedures

Sample 1. By arrangement with the College of Liberal Arts Dean's Office, an e-mail inviting students to participate in a brief online survey was distributed to all students in the College of Liberal Arts at the University of New Hampshire. Students were informed in the recruitment message that they must have been at least 18 years old to participate and that they had the opportunity to enter into a raffle to win one of four \$25 gift cards for their participation in the study.

Sample 2. An advertisement similar to the recruitment e-mail used for Sample 1 was posted to Mechanical Turk. Interested participants were informed in the advertisement that they must have been at least 18 years old to participate and that they had to be currently attending a college or university. All participants were informed that those who completed the survey would be paid for their time (see Buhrmester, Kwang, & Gosling, 2011, for a discussion of compensation rates and data quality using Mechanical Turk samples).

For both samples, interested participants were directed to the informed consent document through survey link in the recruitment e-mail. After providing informed consent, participants completed the 15 to 25-minute questionnaire. Following survey completion,

participants were shown a debriefing form and directed to another website where they could enter the gift card raffle (Sample 1) or enter a unique code to receive compensation (Sample 2).

Results

Data Handling

I screened data according to several criteria. First, I ensured that inclusion criteria were met (i.e., participants were at least 18 years old and currently attending a college or university). All participants met the age requirement; however, 5 participants were removed for indicating that they were not currently attending a college or university. Next, I removed 54 participants who answered any of the seven attention check questions incorrectly. Finally, I removed 272 participants for missing any item of the 79-item RAMS measure. This was important to ensure that RAMS factor analyses were not influenced by missing data. This participant screening resulted in the final sample of 683 participants as described in the method section.

With the final sample ($N = 683$) missing data on other variables of interest was relatively minor. With the exception of one variable reported in analyses below—absences in major (160 missing values)—missing values on variables ranged from 0 to 16. Therefore, I conducted analyses based on available data for each pair of variables (i.e., pairwise deletion at the item-analysis level); I did not impute missing values. The data exploration process did not reveal any other potential analytic issues with the data.

RAMS Scale Development

I hypothesized that the RAMS would be a reliable individual difference variable and involve several distinct aspects. This model structure would be reflected in multiple reliable factors drawn from the pool of 79-items.

Fit aims. Contemporary test theory begins with fitting a factor model to obtained test

scores. Tests are expected to be composed of one or more unifactorial scales, where unifactorial implies that the scales measure one psychological entity.

I assessed model goodness by examining a series of statistics most commonly used and recommended to index model fit for factor analyses: the chi square goodness-of-fit index, the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA) (Schreiber, Nora, Stage, Barlow, & King, 2006). I report the chi-square goodness of fit statistics, although this fit statistic is generally considered inadequate when examined on its own because it is highly sensitive to sample size and number of items (Bentler & Bonett, 1980). Bentler and Bonett (1980) recommend that incremental and comparative fit indices (TLI and CFI) for evaluating models are of particular importance, and that their values should be close to .95 or greater (Hu & Bentler, 1999; see also Schreiber et al., 2006 for a review). Large item sets are challenging by their nature and often the fit of models to tests with many items is messy at best (Little, Cunningham, Shahar, & Widaman, 2002). Given the fit issues common to scales with a large number of items and non-continuously scaled variables, CFI and TLI values somewhat under .95 may be considered acceptable (Bentler & Bonnett, 1980; Marsh, Hau, & Wen, 2004; Yu, 2002); I aimed to obtain values greater than .90. Finally, I report the Root Mean Square Error of Approximation (RMSEA), for which lower values are better; values less than .06 reflect an acceptable fit level (Schreiber et al., 2006).

Strategy of analysis.

The typical order of fitting factor models begins with fitting the least restrictive model—the bifactor model—and progresses to more and more restrictive models (correlated simple structure models, second-order models, testlet response models, and/or individual items) as appropriate (O'Connor-Quinn, 2014; Reise, Morizot, & Hays, 2007). The fit statistics from each

model is compared to the next most restricted (or nested) iteration to assess the relative advantages of each individual model (Reise et al., 2007). In this case, my theory would argue for a bifactor model and I will focus on it because of its helpful properties in deciding factor dimensionality—a key issue in a scale with up to 12 possible dimensions (11 secondary dimensions plus a general factor).

Bifactor model. A bifactor model includes both a general dimension on which every item loads and one or more secondary dimensions on which specific subsets of items loads (see Figure 8-1 for a depiction of a hypothetical bifactor model). Each of these secondary dimensions is uncorrelated to the others; instead the general dimension partials out the shared variance among the items, leaving unique variance (not explained by the general factor) that is explained by each individual secondary dimension (O'Connor-Quinn, 2014). Thus, the general factor represents a broad construct, while the secondary factors represent more specific constructs. As applied to the RAMS, I expected an overall factor of “good decision process” to be present in addition to specific factor groupings.

The bifactor model can be used to evaluate whether secondary factors add benefit over a single general factor (Reise, et al., 2007). One way of calculating dimensionality of a bifactor scale is through explained common variance (ECV). ECV is a ratio of variance in the model due to the general dimension (“good decision process”, in this case) to the overall variance in the model (the variance due to the general dimension and the variance due to the specific factors):

$$ECV = \frac{(\sum \lambda_g^2)}{(\sum \lambda_g^2) + (\sum \lambda_{s1}^2) + (\sum \lambda_{s2}^2) + \dots + (\sum \lambda_{sK}^2)}$$

If the general dimension accounts for the majority of the overall variance (i.e., an ECV greater than .90), then the second order dimensions are considered unnecessary (O'Connor-Quinn,

2014). ECVs less than .70 reflect substantial multidimensionality, supporting the use of multiple secondary dimensions to adequately describe the model (O'Connor-Quinn, 2014; Reise et al., 2007). In addition to exploring the overall ECV, it is also helpful to explore ECVs at the secondary factor-level dimension to assess the value of each individual secondary factor in contributing unique variance. ECVs at the secondary factor-level dimension represent the ratio of variance in the items explained by the the general factor over the total variance of the items (due to the general factor and the specific secondary factor). Secondary factors that do not contribute significant unique variance beyond that described by the general factor (i.e., demonstrate unidimensionality with the general factor) would not warrant individual consideration or may be consider being removed from the scale.

Exploratory factor analysis. To obtain an initial sense of the item groups, I began by conducting an exploratory factor analysis (EFA) on the full 79 items using a facparsim rotation. Facparsim rotations are helpful for distributing large numbers of items and categorical response options (among other) items across factors outside of perfect simple structure models (Finch, 2011; Sass & Schmitt, 2010). I examined from 1 to 12 factor solutions in this first step. The seven-factor solution demonstrated good fit to the data: X^2 (df = 2549) = 4397.03; CFI = .96; TLI = .95; RMSEA = .033; with small to moderate correlations among the factors (r_s = .04 to .38). More importantly, the item clusters represented by these items formed seven interpretable factors: (a) Balance and Flexibility, (b) Prestige and Future Concerns, (c) Interpersonal Similarity, (d) Effort and Difficulty, (e) Interest, (f) Perceived Competence, and (g) Decision Aversion. A brief description of each factor is presented in Table 8-3.

Confirmatory factor analysis. I proceeded to a confirmatory factor analysis (CFA) to confirm the seven-factor structure obtained in the facparsim-rotated EFA solution with the

addition of a general factor to represent a complete overall bifactor model structure. The initial CFA fit for the bifactor solution based on the 7-factor EFA was adequate: χ^2 (df = 2923) = 7015.17; CFI = .91; TLI = .91; RMSEA = .045. A depiction of the model is shown in Figure 8-2. Additionally, items and their loadings on their assigned secondary factor as well as on the general factor (Satisfaction with Major) are presented in Table 8-4.

As indicated above, bifactor models can be used in conjunction with Explained Common Variance (ECV) analysis to determine whether the model is best explained through the inclusion of secondary dimensions, and if so, how many secondary factors represent sufficient unique variance to merit inclusion. I calculated ECVs for the overall scale and for each subscale. The ECV for general factor of the 79-item solution was .65. Because the general factor explains only 65% of the scale variance (i.e., is less than .70), I can reasonably conclude that secondary factors will be needed to account for greater variance in the participants' responses (O'Connor-Quinn, 2014; Reise et al., 2007).

I next turned to the "value added" of the seven specific scales. The ECVs based on the seven secondary dimensions ranged from .26 to .87, with only two of the seven with ECVs greater than .70. ECVs between .70 and .90 are considered "a grey area on the dimensionality spectrum" (O'Connor-Quinn, 2014, p. 30) and I decided to tentatively proceed with these secondary factors in the model; that is, to preserve the seven secondary factor structure.

Proceeding with this 8-factor model (the general factor and 7 secondary factors), I attempted to improve its fit to the overall scale. In a never-before explored measure such as this, many items are likely to underperform and that was the case here. I deleted 21 items that failed to function well as reflected by factor loadings less than .15 on the general factor or less than .15

on their unique secondary factors. Eight more items were deleted for failure to fit the model (modification indices greater than 40).

When the 8-factor (1 general and 7 secondary factors) bifactor model was fit to the 50 remaining items, fit improved to $X^2(df = 1125) = 2959.88$; CFI = .94; TLI = .94; RMSEA = .049. A list of items by factor is presented in Appendix F. Cronbach alpha reliability was .93 for the full scale (i.e., the general factor) and ranged from .60 to .88 on the seven secondary factors; reliability estimates are presented in the second-to last column of Table 8-2.

RAMS Correlational Analyses

Prior to the correlational analyses, I explored relations between demographic variables and the RAMS. Two demographic variables were related to participants' RAMS general and subscale scores and were used as covariates in subsequent analyses: sample source (i.e., UNH or Mechanical Turk participant) and participant sex. I had hypothesized that the RAMS would demonstrate relations with personal intelligence and other academic variables.

Relation between RAMS and personal intelligence. Because I could not anticipate the final factor structure of the RAMS prior to analysis, I did not venture any specific hypotheses beyond the prediction that personal intelligence would be related to a well-reasoned choice of major. I performed a correlation between personal intelligence and the RAMS factor scales. After controlling for the sample source and participant sex⁸, I found that a higher level of personal intelligence was associated with higher levels of the general factor, interpersonal similarity, interest, and perceived competence, supporting the hypothesis. Lower personal intelligence was related to students choosing majors with lower perceived prestige, choosing

⁸ I also performed the correlations without controlling for sex and sample source. The patterns discussed here remained without using these two variables as covariates.

more difficult majors, and a student's aversion to making a decision. Correlations are presented in the first column of Table 8-5.

Relation between RAMS and academic variables. I performed a series of correlations comparing RAMS scales and academic variables controlling for sample source and participant sex. Correlation values are presented in Table 8-5.

I found that overall GPA and GPA in one's major were positively related to the general factor, levels of interest in the major, and perceived competence; students who reported their majors were more difficult, and who had wished others decided their majors for them (Decision Averse) exhibited lower overall GPA and major GPA. However, the relation between decision aversion and GPA was only significant for GPA in the student's major.

In line with expectation, study behavior for major-related courses was associated with several aspects of students' reasoning about their major: higher overall, higher interpersonal similarity, higher interest, higher perceived competence, and lower concern for prestige.

More absences in courses for their major were related to higher perceptions of effort and difficulty of their major. Additionally, contrary to expectation, I found that the number of times students had changed their major was unrelated to their reasoning about majors.

Finally, students with intentions to withdrawal from the university had made a less well-reasoned choice of major overall ($t(680) = 3.24, p < .05$), perceived greater difficulty of their major ($t(680) = -4.33, p < .05$), less interest in the major ($t(680) = 2.41, p < .05$), less perceived competence ($t(680) = 3.57, p < .05$), and greater decision aversion ($t(680) = -3.28, p < .05$).

Discussion

The goals of the current study were (1) to develop a measure that could capture important components of students' reasoning about their choice of major and (2) to explore the relations

between the newly developed scale, personal intelligence, and academic correlates that I hypothesized would be related to students' reasoning about their major choice.

Measurement Model

I was able to model the RAMS successfully by using a bifactor structure including a general factor reflecting students' "Satisfaction with their Major" and seven secondary dimensions to describe specific components of students' reasoning. Although I had anticipated a general factor to reflect "good decision process," the final set of items, when viewed together was more reflective of students' affective reasoning processes association with their thoughtful liking of their choice of major that was better described by "satisfaction with major." Regarding the 11 theoretical areas I had originally identified, some theoretical areas cluster together empirically. For example, the prestige dimension overlaps with the a priori "external rewards" area; the interpersonal similarity dimension is nearly identical to the "matching people and interests" a priori area; the "interest" dimension is largely a synthesis of the "personal growth" and "valuing content" a priori areas. I also have evidence for a general factor that explains a portion of the variance, and support for using the seven secondary factors as unique constructs in understanding students' reasoning about their major.

Correlation Explorations

Personal intelligence was related to the general and all secondary factors of the RAMS except for students' valuing of balance and flexibility within their major; the strongest relations were found between personal intelligence and students' perceived competence, effort and difficulty, and decision aversion. This supports the idea that students who have greater understanding of themselves use their insight to select a major that matches their skill level; by contrast, students who do not have as much insight into their personality relevant information are

more likely to choose a major that will require more effort and that they will struggle with, or rely on non-personally relevant sources to select a major.

I found small to moderate relations between students' reasoning about their major and their GPA, absences from courses, time spent studying for courses in their major, and their withdrawal intentions. These relations were consistent with the hypothesis that students who are engaged in an active and thoughtful reasoning process in selecting their major will have better academic performance and experiences. Students' reasoning about choosing a major was unrelated to the number of times they changed their major. Perhaps switching major reflects different processes in different people: for some, thoughtful exploration; for others, untenable decision-making.

In the next chapter I will present Study 2—a replication and extension of this work.

Chapter 9

Study 2: Understanding Outcomes of a Personally Intelligent Choice of Major

Study 2 was intended to serve as a cross-validation of the measure developed in Study 1 and a replication and extension of whether students' major selection influences their academic experiences. The extension includes a test to examine the influence of interest-major congruence on students' success in college. Given my interest in the practical utility of understanding students' reasoning about choosing their major, a further extension explored the role of academic advising in students' major choice and outcomes.

Hypotheses and Aims

Scale validation aims and hypotheses. In Study 2, I aimed to confirm the bifactor model formed in Study 1, consisting of a general factor and seven secondary factors. I hypothesized that the model would be replicated and demonstrate acceptable fit.

Correlational aims and hypotheses for the RAMS. I aimed to cross-validate the 8-factor structure of the RAMS, replicate tests of the relation of the RAMS and personal intelligence to academic outcomes. As before (Study 1), I hypothesized that the RAMS would be related to personal intelligence, and both would relate to academic outcomes. To the academic outcomes, I added measures of satisfaction with advising and interest-major fit. I also included dimensions of an expanded model of the Big Five personality traits (the Big 6 or HEXACO model), including Extraversion, Neuroticism, and similar qualities to explore their relation with the RAMS and academic outcomes. I hypothesized that there would be some overlap between the RAMS and students' adaptability, but that the RAMS would be a distinct construct.

Method

Participants

Participants were 323 college students recruited through the Department of Psychology research participant pool. Participants received course credit in exchange for participation. To participate, students must have been at least 18 years old.

Measures

I employed the same background information and academic outcome questions (as indices of a good major choice) and the TOPI-MINI-12 as described in Study 1. In addition, I employed several other measures.

Background information. The demographic questions were the same as in Study 1. Average age of participants was 19.47, ranging from 18 to 30. All other descriptive statistics for the sample are presented in the second column of Table 8-1, and are by-and-large similar to the values in the initial study. In Study 2, the sample, which consisted exclusively of university students represented students across the four years of college, and 49 different majors—the most common majors were Psychology (30%), Undeclared major (10.2%), Neuroscience and Behavior (4%), and Recreation Management (3.7%).

Reasoning About Major Survey (RAMS). As in Study 1, but now scored for the overall factor of “Satisfaction with Major” and seven secondary factors of Balance and Flexibility, Prestige and Future Concerns, Interpersonal Similarity, Effort and Difficulty, Interest, Perceived Competence, and Decision Aversion. Cronbach alpha reliabilities for each scale were acceptable and ranged from .75 to .93, with the exception of the Balance and Flexibility factor ($\alpha = .50$).

Personal intelligence. In addition to the TOPI-MINI 12 used in Study 1, I added 37 items representing most of the Adaptability Personal Intelligence subscale of the Test of Personal

Intelligence 1.4 (TOPI 1.4; Mayer, Panter, & Caruso, 2015). The TOPI 1.4 is psychometrically superior to the TOPI-MINI-12. Further, the Adaptive PI scale is highly correlated with overall personal intelligence and in addition emphasizes the ability to motivate oneself and to plan in accordance with one's needs. Reliability for the Adaptive PI subscale in the was .88.

Interest-major congruence.

Vocational Interests. Interest-major congruence involves comparing students' interests with their majors. I measured the interest component using the current edition of the Unisex Edition of the ACT Interest Inventory (UNIACT-S; ACT, 2009). The UNIACT-S is a 72-item measure assessing individuals' occupational interests in 6 areas corresponding to the six Holland occupational codes. These are Technical (Realistic) Science & Technology (Investigative), Arts (Artistic), Social Service (Social), Administration & Sales (Enterprising), and Business Operations (Conventional). Participants indicate whether they would like, dislike, or are indifferent to each of the 72 activities listed (12 items on each area). Sample items include "use a microscope or other lab equipment", "play in a band", "build furniture"). Participants respond that they *like* an activity (coded as 3), are *indifferent* to it (coded as 2), or *dislike* it (coded as 1). Scores in each of the six domains were averaged and converted to a T-score based on ACT norming samples (ACT, 2009). Cronbach alpha reliabilities for the six domains ranged from .83 to .89.

Students' Majors. To evaluate student majors, I converted the students' majors from the University of New Hampshire (from which all respondents came) into 2010 Classification of Instructional Programs (CIP) codes developed by the National Center for Education Statistics (NCES, 2011). This is a universal system for classifying majors across the U.S.

Next, I shared a de-identified data file containing the Classification codes and the

UNIACT scores with researchers at ACT, a non-profit organization that oversees the ACT college entrance exam and other testing and analytics services. Researchers at ACT have identified average Holland codes for students within a major, thus providing a score on each of the six-dimensions for each major. For example, the Holland profile for an accounting major has a highest value for Conventional (60 on a T-score scale), and lower scores on each of the others. Due to intellectual property concerns, ACT does not disclose their full list of Holland codes on each of the six dimensions for all majors. However, researchers at ACT returned a file to me including each participant's interest-major congruence correlation value that they calculated in-house.

Congruence Metric. The congruence statistic calculated for each participant used the profile correlation method. The profile correlation method represents the degree of linear relationship between a student's interest scores and the scores associated with their chosen major using Pearson product moment correlation. A correlation of 1.0 would indicate a perfect rank match between their interests in the six areas and the typical interests of people in the major. A correlation of 0 would indicate no relationship. Previous research (e.g., Allen & Robbins 2010) have reported acceptable—.76—test-retest reliabilities of the congruence statistic. This is now one preferred method among many for calculating the interest-major congruence (e.g., Arthur, Bell, Villado, & Doverspike, 2006).

Adaptability. I measured student adaptability to different learning situations using the nine-item learning adaptability subscale of the I-ADAPT measure (Ployhart & Bliese, 2006). Participants indicated their level of agreement on each item using a 5-point Likert-type scale from 1 (*strongly disagree*) to 5 (*strongly agree*) and a mean score was computed. Sample items include “I quickly learn new methods to solve problems” and “I take responsibility for acquiring

new skills.” Cronbach α for the sample was .81.

Other personality traits. To compare the RAMS with other personality variables, participants completed the 24-item Brief HEXACO Inventory (BHI; de Vries, 2013), an expanded version of the Big Five personality traits. The six dimensions add Honesty-Humility, to the remainder of the Big Five: Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience. Each HEXACO scale was four items long. Participants indicated their level of agreement with each item using a 5-point Likert-type scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Sample items include “Even when I’m treated badly, I remain calm” (Agreeableness) and “I have a lot of imagination” (Openness to Experience). Mean scores were computed for each dimension. Cronbach α ranged from .29 to .56.

Academic Outcomes.

Perceptions of and experiences with academic advising. I included 17 items assessing students’ perceptions of academic advising, their specific experiences with academic advising, and identifying other advising components that students would find helpful. I employed several items developed by other researchers and used in academic advising assessment at other universities—Academic Advising Inventory (Winston, & Sandor, 2002). I edited the response format from the original surveys to be consistent across all items, and also added other items relevant to my study goals. A full list of these items is presented in Appendix E.⁹

Academic variables. I employed the same 14-items assessing academic performance and commitment markers that was used in Study 1. I included an additional three items assessing students’ satisfaction with their education and experiences at the university, how often they

⁹ We present results for five of the 17 items. In hindsight, the other 12 items were duplicative, overlapped with RAMS subscales, or were not worth using in the current study.

consider changing their major, and how often they considered transferring or withdrawing from the university on a 5-point Likert type scale.

Academic burnout. The School Burnout Inventory (SBI; Salmela-Aro, Kiuru, Leskinen, & Nurmi, 2009) addresses three components of burnout in the academic realm: exhaustion at school (e.g., I feel overwhelmed by my schoolwork), cynicism toward the meaning of school (e.g., I feel a lack of motivation in my schoolwork and often think of giving up), and a sense of inadequacy at school (e.g., I used to have higher expectations of my schoolwork than I do now). Students indicate their level of agreement on a six-point Likert-type scale ranging from 1 (*Completely disagree*) to 6 (*Completely agree*). A mean score for all items was calculated and used in analyses. Evidence of prior concurrent validity indicated that higher levels of school burnout are related to lower levels of academic achievement and school engagement (Salmela-Aro et al., 2009). Cronbach α for the single-factor solution was .89.

Procedure. Participants self-selected to participate in Study 2 among other studies available to undergraduate students participating in the Sona research participation subject pool. Participants received course credit in exchange for completing the online survey. After providing informed consent, participants completed the 35-50 minute survey, and then received debriefing information.

Results

Data Handling

I screened data according to several criteria. All participants met the age requirement of being at least 18 years old. Next, I removed 20 participants for missing more than 10 items on the RAMS measure so that the RAMS confirmatory factor analysis was not influenced by missing data. Within the remaining and final sample of $N = 323$, missing data on other variables

of interest was relatively minor, ranging 0 to 36 for all other measures combined. Therefore, I did not impute missing values, and conducted analyses based on available data for each pair of variables (i.e., pairwise deletion at the item-analysis level). The data exploration process did not reveal any other potential analytic issues with the data.

Demographics

Prior to analyses, I explored relations between demographic variables and the RAMS. None of the demographic variables were consistently related to the RAMS scales, so we did not use any covariates in the following analyses.

Replication of RAMS Scale Performance

I hypothesized that the RAMS factor structure identified in Study 1 would be replicated in Study 2, with the general and seven secondary factors demonstrating acceptable fit to the data. We employed the same fit criteria discussed in Study 1: CFI and TLI values approaching .95 may be considered acceptable; RMSEA values less than .06 also reflect an acceptable fit level (Bentler & Bonnett, 1980; Marsh, et al., 2004; Yu, 2002), recognizing that fit to scales with this length and complexity may fall dramatically below those levels (Little et al., 2002). Repeating the confirmatory factor analysis (CFA) with the Study 2 sample yielded fit statistics a bit lower than those in Study 1 but still respectable for a scale of this complexity: χ^2 (df = 1125) = 2306.83; CFI = .91; TLI = .90; RMSEA = .06. Equally important from the standpoint of scale use, the coefficient alpha reliability was .93 for the full scale (i.e., the general factor) and ranged from .50 to .89 on the seven secondary factors.

RAMS and its Relation to Criteria

I hypothesized that I would replicate the relations observed in Study 1, showing that students' well-reasoned major choice (as measured by the RAMS) was related to students'

higher levels of personal intelligence, academic success within and commitment to their major.

Relation between RAMS, the Big Six (and Five), and personal intelligence.

Replicating the results of Study 1, I performed a correlation between the RAMS factor scales, the Big Six, and other variables. A number of low but suggestive correlations were observed between the RAMS, the TOPI and the personality variables: well-reasoned major choices were associated with higher levels of honesty-humility, extraversion, agreeableness, conscientiousness, and openness. Only emotionality did not demonstrate these associations. Correlations for these relations are presented in Table 9-1. The modest relation between the RAMS, personal intelligence, and HEXACO variables indicates that the RAMS and personal intelligence measure something different from the other personality scales.

RAMS scales were moderately related to learning adaptability, with negative relations between adaptability and the effort/difficulty and decision averse factors, as would be expected. Thus, more well-reasoned choices were associated with higher adaptability.

Relation between RAMS and academic advising variables. For the advising variables analysis, we focused on four variables: (a) that students met with their academic advisor more than was required, (b) that students find it difficult to convey their interests and/or concerns to their advisor, (c) how much time is generally spent in each advising session, and (d) how students prepare for their advising appointment. I found that students who made a well-reasoned choice of major were no more likely to meet with their advisor more frequently or spend more time in their advising sessions than students who did not make a well-reasoned choice. In contrast, students who had made a well reasoned choice of major (as supported by the general and all secondary factors) had less difficulty conveying their interests and/or concerns to their advisor. Correlation values are presented in Table 9-2.

In my exploration of how students prepare for their advising appointments, I performed a series of independent samples t-tests and found that students who had generally made a more well-reasoned decision were more likely to: (a) think about what courses they want to take, (b) explore the actual courses being offered in the next semester, (c) make a list of some of the courses they would be interested in taking, (d) actually plan out their schedule, (e) and make a list of questions that they have for their advisor. These trends were consistent across secondary factors as well, with the exception of the Prestige factor; Prestige was only related to advising appointment preparation in the form of thinking about what courses they wanted to take. Also of note, very few of the students ($n = 13$) said that they did nothing to prepare for their appointment; as a result, the statistical test of this outcome was excluded from analyses. Results are presented in Table 9-3.

Predictions from Psychological Variables to Academic Outcomes

I performed a series of correlations comparing RAMS scales and academic variables. The complete results of the correlation analyses are presented in Table 9-4. A few key findings are presented below.

Replicating Study 1, Satisfaction with Major Choice (the general factor), and to varying extents the specific RAMS factors, exhibited many correlations in the expected directions. For example, Satisfaction with Major Choice correlated with overall GPA and GPA in one's major ($r_s = .22$), as well as levels of interest in the major ($r_s = .16$ to $.18$), and perceived competence ($r_s = .25$). The specific RAMS scales of effort and difficulty and decision aversion factors also exhibited negative relations (as in Study 1) $r_s = -.28$ to $-.29$, and $r_s = -.15$ to $-.12$ with overall GPA and major GPA, respectively. By-and-large, relations were consistent with those in Study 1 with the exception that Decision Aversion was negatively related to overall GPA $r = -.15$.

Results further indicated that students who had made a well-reasoned choice of major (as measured by both the general factor and secondary factors (with the general factor values presented here; see Table 9.4 for specific scale values) were less likely to consider changing their major ($r = -.47$), reported higher levels of satisfaction ($r = .32$), and lower levels of academic burnout ($r = -.41$). Students who had made a well-reasoned choice of major were less likely to express interest in withdrawing or transferring from the university ($r = -.16$), albeit these relations were not as strong or consistent across factors.

New Outcome Measures

My new academic outcome measures had included congruence with major and academic burnout. My hypothesis that students who made a more well-reasoned choice of major would choose a major more congruent with their interests was confirmed ($r = .30$ for the general “Satisfaction with Major” factor). This held for many of the individual scales as well. In addition, RAMS scales were negatively related to academic burnout.

Taken together, these results indicated that we can use measures of personal intelligence and students’ reasoning about their major (RAMS) to identify students who make a well-reasoned choice of major. Further, students higher in personal intelligence and who demonstrate better reasoning in choosing their major (i.e., students with higher scores on the RAMS) show greater academic success and commitment to their major and the university.

Discussion

The goals of the current study were (1) to confirm the bifactor model proposed in Study 1, (2) to investigate the relations between the RAMS and other psychological variables of interest, (3) to examine the relation between the RAMS and students’ engagement with advising services, and (4) to explore and replicate relations of the RAMS with personal intelligence,

measures of academic success and commitment, and interest-major congruence.

Measurement Model

I confirmed the bifactor structure of the RAMS identified in Study 1, supporting the general factor and seven secondary factors as described previously. Although the model fit statistics did not meet the ideal criterion of values near .95 (Bentler & Bonett, 1980), they were greater than or equal to .90, demonstrating acceptable fit levels, especially considering our large number of items and modest sample size.

Correlation Explorations

The further aims of the study concerned exploring the relation between the RAMS and personal intelligence, as well as academic, psychological, and student advising variables. Overall, we found that students' well-reasoned choice of major was related to higher personal intelligence, higher levels of certain personality traits (i.e., honesty/humility, extraversion, agreeableness, conscientiousness, and openness), and students' ability to convey their interests and concerns to their academic advisor. Better reasoning was related to more positive academic outcomes (i.e., higher GPA, more commitment to their major, greater congruence between their interests and their major choice), and higher levels of academic adaptability. Thus, students' who have made a well-reasoned choice are at an academic advantage over students who have made a less well-reasoned decision.

The results of these analyses lend support to the use of the RAMS in quantitatively describing the influences on students' choice of major and the how these influences are related to students' performance and perspectives as a student.

In Chapter 10 I discuss my overall findings in depth, contextualize the current findings in the larger literature introduced in Chapters 2 through 4, describe some of the limitations of the

current series of studies, and provide suggestions for future research on the topic.

Chapter 10

General Discussion

The current series of studies were designed to establish how students reason about and select a college major. Prior to this undertaking, students reasoning abilities with regard to select a major had never been posited explicitly as an individual difference variable; rather, this was an untested assumption embedded within the framework of previous research. Further, it has been unclear whether such a reasoning ability would provide substantial benefit to students in their academic careers. Even so, without an explicit and detailed understanding of students' reasoning about their major, there was no way to identify students (on a quantitative basis) that are engaged in relatively strong or poor decision-making processes.

Building on the research-support assumption that students' personality varies across major, and that students vary in their ability to self-select into a major that represents a good fit for themselves, I sought to clarify and describe students' process of choosing a major. I employed the personal intelligence framework to structure my undertaking—that students who have stronger abilities in observing and assessing their own and others' personality information, will be at an advantage in self-selecting into environments that use and value their own traits. I began by integrating prior research on the influences on students' choice of major with my own qualitative exploration of students' reasoning process (the Preliminary Study). I used these sources to develop a measure that could be used to describe the influences and overall decision process students undertake when selecting a major (Study 1). I then sought to explore some of the practical implications of this students' ability to engage in high levels of thoughtful reasoning

in choosing their major. I used the developed measure to examine the relationship with personal intelligence (Studies 1 and 2) and to explore its correlations with students' academic outcomes (Studies 1 and 2) and the relationship between this measure and other psychological variables of interest (Study 2).

Developing a Measure

Relying on prior research and a semi-structured qualitative interview study conducted for the purpose, I constructed a 79 item scale intended to assess students' processes in deciding on a major. Items on the scale were formulated to assess 11 areas that emerged from these multiple sources as relevant to students' decision process, such as confidence, personal growth, and external rewards.

In Study 1, where I first examined the scale, I obtained a model of a general factor reflecting students' Satisfaction with the Major and seven secondary factors quantifying the influences on students' choice: (a) Balance and Flexibility, (b) Prestige of Major, (c) Interpersonal Similarity (with Other Students with the same Major), (d) Effort and Difficulty, (e) Interest in the Subject Matter, (f) Perceived Competence, and (g) Decision Aversion. The seven obtained specific scales overlapped to a considerable degree with the 11 initial areas. Several areas were largely preserved as factors, whereas other theoretical areas clustered together empirically to form a new composite factor. The factor structure of this model showed good fit to the data in Study 1 and, in a replication, acceptable fit in Study 2, supporting the use of the RAMS as a measure of students' reasoning about their choice of major. Thus, I was able to develop a measure demonstrating good psychometric properties to measure quantitatively an individual difference variable in students' own reasoning processes in selecting a major.

Personal Intelligence and the RAMS

Across Studies 1 and 2, I found that personal intelligence was related to students' reasoning about their choice of major (the RAMS). Students who reported reasoning well (higher scores on the general factor of the RAMS: Satisfaction with Major) about their choice of major also earned higher scores on the personal intelligence ability measures. This finding supported my hypothesis that students with higher personal intelligence—who, by definition have higher ability at identifying personality-relevant information from their surroundings and using that information to guide their choices—would be better equipped to make a more reasonable choice of major. The personal intelligence framework was highly useful in contextualizing students' reasoning and represents an application of personal intelligence to real-world decision-making processes.

Although Studies 1 and 2 were cross-sectional, the current findings when paired with theory suggest that, over time, students beginning in college who are able to access information about their own personality and the personally-relevant information specific to a given major are able to fit themselves to their major. In contrast, those lower in personal intelligence may benefit more from university support and advising services in exploring and identifying a college major. (Of course, it also is possible that those higher in personal intelligence make better use of such services).

Psychological Correlates of the RAMS

I included several psychological variables in Study 2 to explore relations with the RAMS including adaptability (as measured by the Learning Adaptability subscale of the I-ADAPT; Ployhart & Bliese, 2006) and the Big Six personality traits. Of particular interest in these analyses, I found that students higher in learning adaptability also demonstrated better reasoning about their choice of major. It may be that students who are more adaptable in learning contexts

are better able to fit in multiple environments and their positive performance may be related to their relatively easy adaptation to different learning modalities; that said, the RAMS exhibited stronger relations with the academic outcome variables than adaptability. Thus, although students' learning adaptability may help explain some of the benefits associated with students' academic performance, students' well-reasoned choice of major provides a unique potential source of explanation for student success.

Predicting Academic Outcomes from the RAMS

In Studies 1 and 2, I explored the relation between the RAMS and several key academic outcome measures. Consistent across both studies and with my hypotheses, I found that a more well-reasoned choice of major was associated with with better academic performance. This performance was evident in higher GPA overall and in major, more commitment to the major, more studying for courses in the major, fewer absences from courses in their major, and fewer intentions to withdraw or transfer from the university.

The RAMS was also related to additional academic outcome variables included in Study 2. The relation between a more well-reasoned choice of major, as assessed by the RAMS and increased commitment to the major was reflected in increased satisfaction with the major, less consideration of changing majors, and less academic burnout. Correlation values ranged from small to large, supporting that the RAMS may be beneficial in predicting tangible student outcomes.

A final variable of note was the relation between the RAMS and interest-major congruence. As reviewed in Chapter 4, a considerable body of research has explored the role of interest-major congruence with many of the academic outcomes explored here, showing mixed support for the importance of students' "fit" between their interests and their academic

environment. On the whole, correlations between the RAMS and interest-major congruence ($r_s = .03$ to $.30$) were similar to or less than the magnitude of correlations between the RAMS and personal intelligence ($r_s = .15$ to $.42$). More importantly, however, these correlation values support the suggestion that students' reasoning about their major (as measured by the RAMS) is extends beyond students' selecting into a major that matches their interests. The RAMS also acknowledges and includes other influences not captured by interest measures used in calculating interest-major congruence (e.g., the perceived prestige of the major, the freedom to balance their major-related pursuits with other goals, the general aversion or struggle with selecting a major for themselves). Based on the presence of these other factors in informing a more complex understanding of students' well-reasoned choice of major, we may sensibly expect that the RAMS will be more consistent in predicting students' academic success and other academic outcomes than interest-major congruence measures have in the past.

Significance for Students, Parents and Administrators

These outcomes are of interest to students, their parents, and college administrators. Given the rising costs of a college education (i.e., 39% increase between 2002-2003 and 2012-2013; NCES, 2013), students (and their parents) are invested in making a decision about college major quickly to graduate within the proscribed four-year plan. College administrators are also concerned with student success, satisfaction, and retention rates. Understanding the role of students' major selection, and what influences this choice may provide an avenue for university support systems to address students early in their process to promote strong academic performance and commitment in previously unexplored domains—such as addressing students reasoning about their major and provide support for students selecting a major that will lead them to better outcomes.

Limitations and Future Directions

A few limitations of the current series of studies are worth discussion, along with future directions for research to address these limitations. First, the studies described here were cross-sectional, preventing any developmental hypotheses to be tested across the four years of college. Rather, Studies 1 and 2 primarily addressed students after they had selected a major; some items on the RAMS required students to answer in retrospect, a process that may have been more difficult for students who had not yet declared their major before taking the survey. More could be learned by assessing students over the different stages of their decision process, from before they decided, to immediately after declaring a major, to considering a major change (when that occurs).

For example, our finding that a more-well-reasoned choice of major is associated with greater academic success (as measured by GPA) might be influenced by their general intelligence or abilities as students. Longitudinal research would allow researchers to predict later outcomes, correcting for previous reports or performance. Further, due to the large percentage of students who declare their major prior to beginning classes (33% and 47% as measured in Studies 1 and 2, respectively), ideally, longitudinal research would begin to follow samples of high school juniors and seniors and continue with students as they proceed to graduation from university.

A third limitation of the studies reported here was that our sample from Study 2 was exclusive to students at the University of New Hampshire enrolled in a psychology course participating in exchange for course credit. This limitation is highlighted by our finding of sample source differences in the RAMS in Study 1. Across the measures utilized in Study 1—the RAMS, TOPI, and academic outcomes—I found that students from the University of New

Hampshire responded differently in some respects from students obtained through the Mechanical Turk sample of students from colleges and universities across the United States¹⁰.

Although the pattern of results was consistent even when controlling for source, and it is possible that these differences were due to the different selection biases of students responding in these two different sampling environments, it raises the importance of exploring students' RAMS responding, and whether it invariant across different kinds of colleges and universities. In order to explore this possibility, future research should obtain samples of students across several college/university distinctions (e.g., 2-year and 4-year degree-granting institutions, public and private colleges, universities of various student size, location of the university).

Finally, data collected in the current study was based on participants' self-report. It is possible that students responded in ways that would make them appear more favorable—as stronger students academically (on the questions assessing their academic-related behavior) or viewed their major and their decision process more favorably (on the RAMS items)—than would be accurate otherwise. This concern is not relevant for the measures of personal intelligence given that this is an ability measure, and students' attempts to respond more favorably would not provide a bias in data patterns. Regarding the academic measures, prior research reports a strong correlation ($r = .90$) between students' official GPA and self-reported GPA (Kuncel, Credé, & Thomas, 2005), lending support for the confidence in the academic correlation results obtained

¹⁰ Students obtained through the Mechanical Turk sampling method scored significantly lower on personal intelligence, several of the RAMS secondary factors measures. However, of the academic outcome measures, only the time spent studying differed significantly by sample—students from the Mechanical Turk sample studied more than their University of New Hampshire counterparts. The Mechanical Turk sample was also significantly older, more racially diverse, and had more men than the University of New Hampshire sample

in the current studies. However, follow-up research should endeavor to obtain access to student records to corroborate the relationships reported here.

Regarding the RAMS measure, students may have been influenced by demand characteristics. Although some of the RAMS secondary factors did have high mean ratings (e.g., perceived competence, interest), these factors were among the most strongly and consistently endorsed influences on major choice in previous research (see Chapter 3) and would be expected to show especially high ratings. There were a few categories that students endorsed more moderately (e.g., decision aversion, prestige, effort and difficulty); however, low responding in these categories would also be supportive of the argument that participants engaged in socially desirable responding. Future work would benefit from the inclusion of measures of socially desirable responding to assess the honesty and reliability of students' self-report on the RAMS.

Conclusion

In the current series of studies, I identified core themes of students' decision process for selecting a major from previous research and semi-structured initial interviews. I explored and confirmed a factor structure to model students' well-reasoned choice of major that included a general factor (students' Satisfaction with the Major) and seven secondary factors (Balance and Flexibility, Prestige, Interpersonal Similarity, Effort and Difficulty, Interest, Perceived Competence, and Decision Aversion). By exploring the relations of students' reasoning with personal intelligence and academic and advising outcome variables, I found that students who made a well-reasoned choice of major demonstrated higher levels of personal intelligence, greater academic performance (e.g., higher GPA), higher levels of academic commitment (e.g., fewer absences in courses for their major, less consideration of changing their major or withdrawing/transferring from the university), and engage in more preparation for their advising

appointment. The findings of this research support the obtained RAMS model as a reliable measure of students' decision process and demonstrate the potential for predictive utility of the RAMS in assessing student success and commitment to their major—outcomes that are highly important to both students and university administrators.

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TABLES

Table 3-1

Students' Self-Reported Reasons for Choosing a Major.

Reason	1	2	3	4	5	6	7	8	9	10	11	12	SUM
Interest in Subject Area	1	1	1	1	1			0	1	1	1	1	9
Enjoy Learning in Area		1	0	1						1	1	1	5
Job Prospects		0	0	1			1		1	0	1		4
Want Career Associated with Major		1	0		1		1			0	0		3
Preparation for Future Goals				0	1		0	1		1	0	1	4
Intrinsic Motivation (e.g., interesting work, instructional quality, opportunities for work experience, interacting with others)					1								1
Content Motivation (e.g., course requirements, writing, synthesizing information)					1								1
Major Attributes	1									0			1
Career Advancement									1				1
Social Motivation (personal experience, parental influence, flexible work hours, previous experience, scholastic challenges, job security)					1								1
Self-Efficacy								1					1
Helping Others			1										1
Competence or Fit with Abilities							1	0	0				1
Background in Coursework/Previous Experiences		0	0	0					0	0	0		0
Increase Self-Knowledge										0	0		0
Liking Children		-1	1										0
Requirements of Major									0				0
Job Characteristics or Opportunities	1	-1		0								0	0
Reputation of Major or University				0			0		0				0
Quality of Instruction		0	0	0			0						0
Know Others		0	0										0
Practical Motivation (cost of major, current job market, projected earnings, reputation of major)					-1			1					0
Allows Time for Other Activities												0	0
Lifestyle Associated with Major				0									0
Psycho-social Benefits	-1												-1
Science Motivation (i.e., importance of math and science)						-1							-1
Information Search	-1												-1
Prestige or Respect Associated with Major or Career			-1	0								0	-1
Association Motivation (importance of major-related club and honor societies)						-1							-1

Table 4-1

Key Findings from Studies Examining Academic Outcomes Associated with Congruence

Outcome Measure	Relevant Research
Academic Performance	<ul style="list-style-type: none"> - Interest-major correlation was not a significant predictor of first-year GPA^a - Changes in fit and satisfaction led to changes in GPA at subsequent time points^f - There was mixed support for the relation between congruence with GPA and environmental constraint (depending on method and time point)^g - Across 3 time points predicting GPA criteria, higher GPA was associated with higher levels of congruence on the Euclidean distance measure only^h - Greater objective fit was related to higher GPAⁱ
Satisfaction	<ul style="list-style-type: none"> - Full mediation of fit with major between self-regulated decision-making and major satisfaction^b - Full mediation in effect of Person-Job fit between self-regulated decision making and job satisfaction^b - Students with congruent and incongruent majors did not differ in levels of satisfaction, college engagement, or discontent regarding the college career^e - Academic fit at time 1 and time 2 led to satisfaction at time 2^f - In turn, satisfaction was positively related to GPA at later time points (although not strong) and negatively related to withdrawal intentions and absenteeism at later time points; there was no relation with organizational citizenship behavior^f - Fit was unrelated to institutional satisfactionⁱ - When students have lower perceived fit, those higher in adaptability had greater institutional satisfaction than those low in adaptability; when students were high in fit, adaptability did not matterⁱ
Persistence and Commitment to Major	<ul style="list-style-type: none"> - Interest-major correlation significant predictor of timely degree attainment^a - Changes in fit and satisfaction led to changes in turnover intent, but not absenteeism, at subsequent time points^f - There was an interaction between congruence and environmental constraint: congruence related to persistence only when environmental constraint was high (when constraint was low, there was a small correlation between congruence and persistence)^g - Congruence during first year was related to persistence in major in third year^g - There was an interaction between congruence and interest on retention—students with lower interest profiles required higher levels of congruence to stay enrolled beyond first year^g - In predicting persistence, for both congruence measures, higher congruence was related to increased persistence, but there was a moderation effect for congruence-criterion relation depending on level of interest. Higher congruence was associated with persistence for those with lower interest levels, but not present for those with high interest levels^h - Fit was unrelated to probability of major change and unavoidable absencesⁱ - Greater objective fit was related to more affective commitment, and more normative commitmentⁱ - Greater perceived fit related to higher levels of adaptabilityⁱ
Interests and Abilities	<ul style="list-style-type: none"> - Students who did not enter a "fitting" environment (first type of incongruence) either maintained or decreased in the interests and abilities of the environment they did not enter^c - Students who entered a "nonfitting" environment (second type of incongruence) actually increased in the interests and abilities of the environment they did enter^c - Incongruent students (non-type persons in type majors) never reach the interest/ability level of congruent students^e - For investigative types, having a congruent major led to increases in investigative-related interests/abilities over the four years but there was no change for investigative students in incongruent majors^d

-
- For artistic types, having a congruent major led to an increase in artistic interests/abilities over 4 years; decrease in artistic score for those in incongruent majors^d
 - For social types, there were similar patterns of increase/decrease for congruent/incongruent students' interests/abilities, but the effect was weaker^d
 - For enterprising types, there was a similar pattern as seen in Investigative for students' interests/abilities, but no initial differences between congruent and incongruent enterprising majors^d
 - Greater perceived fit related to more affective commitment and greater academic self-efficacyⁱ
-

Note. a = Allen & Robbins (2010); b = Eun, Woo Sohn, & Lee (2013); c = Feldman, Ethington, & Smart (2001); d = Feldman, Smart, & Ethington (1999); e = Feldman, Smart, & Ethington (2004); f = Schmitt, Oswald, Friede, Imus, & Merritt (2008); g = Tracey, Allen, & Robbins, 2012); h = Tracey & Robbins (2006); i = Wessel, Ryan, & Oswald (2008).

Table 7-1

Students' Areas of Reasoning About their Major.

	Name of Category	Description
1	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
2	Confidence	The level of confidence students have in their ability to perform well in the major
3	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
4	Personal Growth	The role of reflection and introspection leading to psychological growth that is associated with their pursuit of a major
5	Extrinsic–Intrinsic Motivation I: Valuing the Content	How much and the relative importance students place on the inherent joy derived from the major
6	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
7	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)
8	External Rewards	The role of potential benefits (e.g., salary, prestige) in directing students' choice of major
9	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
10	Matching People and Interests	How well students' own interests and personalities are aligned with their classmates within the major
11	Fit with Self	How well students' own interests and personalities are aligned with the characteristics and expectations of the major

Table 8-1

Descriptive Statistics of Demographic and Academic Background Variables

Variable	Study 1 <i>n</i> (%)	Study 2 <i>n</i> (%)
Sample Source		
UNH	290 (42.5%)	323 (100%)
Mechanical Turk	393 (57.5%)	n/a
Sex		
Male	251 (36.7%)	95 (29.4%)
Female	430 (63%)	227 (70.3%)
Other	2 (0.3%)	1 (0.3%)
Race/Ethnicity		
American Indian or Alaska Native	3 (0.4%)	1 (.3%)
Asian or Asian American	39 (5.7%)	12 (3.7%)
Black or African American	39 (5.7%)	6 (1.9%)
Hispanic or Latino	27 (4.0%)	3 (0.9%)
Native Hawaiian or Other Pacific Islander	1 (0.1%)	--
White	547 (80.1%)	294 (91%)
Multiracial	27 (4.0%)	7 (2.2%)
Class Standing		
First-year/Freshman	124 (18.2%)	118 (36.5%)
Second-year/Sophomore	189 (27.7%)	120 (37.2%)
Third-year/Junior	151 (22.1%)	56 (17.3%)
Fourth-year/Senior	159 (23.3%)	23 (17.3%)
Fifth-year or beyond	59 (8.6%)	5 (1.5%)
Times Changed Major		
n/a	103 (15.1%)	34 (10.5%)
0	355 (52%)	161 (49.8%)
1	153 (22.4%)	70 (21.7%)
2	47 (6.9%)	12 (3.7%)
3	19 (2.8%)	8 (2.5%)
4+	6 (0.9%)	1 (0.3%)
Declared Current Major		
n/a	99 (14.5%)	34 (10.5%)
Prior to beginning classes	226 (33.1%)	152 (47.1%)
During first year	155 (22.7%)	63 (19.5%)
During second year	145 (21.3%)	56 (16.7%)
During third year	37 (5.4%)	16 (4.9%)
During fourth year or later	21 (3.0%)	4 (1.2%)
Withdrawal Intentions		
None	538 (78.8%)	
Considering	108 (15.8%)	
Yes	36 (5.3%)	

Table 8-2

Correlations among RAMS Factors and Other RAMS Evaluative Statistics

	1	2	3	4	5	6	7	8
1. General		.52*	-.55*	.70*	-.76*	.86*	.84*	-.73*
2. Balance & Flexibility	.52*		-.18*	.33*	-.35*	.41*	.38*	-.26*
3. Prestige	-.60*	-.22*		-.32*	.28*	-.33*	-.39*	.33*
4. Interpersonal Similarity	.70*	.33*	-.34*		-.43*	.58*	.53*	-.40*
5. Effort and Difficulty	-.76*	-.34*	.32*	-.43*		-.52*	-.60*	.58*
6. Interest	.86*	.40*	-.39*	.58*	-.51*		.70*	-.54*
7. Perceived Competence	.84*	.37*	-.42*	.53*	-.59*	.69*		-.60*
8. Decision Aversion	-.72*	-.25*	.38*	-.39*	.57*	-.53*	-.59*	
<i>M</i>	3.12	2.82	1.97	3.06	2.06	3.18	3.39	1.63
<i>SD</i>	0.33	0.39	0.51	0.42	0.46	0.43	0.44	0.51
α	.93	.60	.78	.77	.78	.88	.84	.75
Factor-level ECVs		.57	.23	.55	.65	.78	.87	.69

Note. Correlations presented above the diagonal represent uncorrected values; correlations presented below the diagonal represent values controlling for the influence of gender and data sample. Explained Common Variances (ECVs) are reported here for the initial 79-item solution of the RAMS instead of the final 50-item solution used for all other values.
 ** $p < .05$.

Table 8-3

Bifactor Dimensions Descriptions

Dimension	Label	Description
General	Satisfaction with the Major	Students have actively considered their options for a major and believe that their choice has resulted in positive outcomes. Students believe that they have made the best decision regarding major choice.
Secondary Factor 1	Balance and Flexibility	Students value that the requirements and schedule of the major allows them the freedom to explore their own specific interests within their major and across other domains of their life.
Secondary Factor 2	Prestige	Students are concerned for their future success and the prestige associated with the major.
Secondary Factor 3	Interpersonal Similarity	Students believe that they share common qualities and interests with other students in their major.
Secondary Factor 4	Effort and Difficulty	Students perceive that the work required in their major is difficult and that their effort falls short of others' expectations; they may recognize feelings of less autonomy for their work.
Secondary Factor 5	Interest	Students demonstrate strong enjoyment of the major and feel personal fulfillment or growth from the major.
Secondary Factor 6	Perceived Competence	Students perceive that they have the skills and abilities that will help them to succeed through the merit of their own work in the major.
Secondary Factor 7	Decision Aversion	Students do not feel invested in making their own decision about a major; they may prefer to let others choose for them or decide based on the wishes of others.

Table 8-4

Factor Loadings for Final Scale Items on the General Factor and Secondary Dimension.

Item	Loading on g	Secondary Factor	Secondary Factor Loading
This major allows me to balance school with other aspects of my life (so I can pursue other interests or activities).	.43	1: Balance and Flexibility	.61
This major allows me to have a flexible schedule to pursue my interests within this area.	.39	1: Balance and Flexibility	.61
It wouldn't be a big deal to change my major.	-.17	1: Balance and Flexibility	.39
There is very little flexibility on the path toward completing my major.	-.30	1: Balance and Flexibility	-.38
This major allows me (or will allow me) to make my own decisions about my coursework.	.46	1: Balance and Flexibility	.35
This major will allow me to fulfill other goals I have in my life.	.64	1: Balance and Flexibility	.17
Other people just want me to choose a major that makes me happy (they don't care what major I choose).	.24	1: Balance and Flexibility	.17
People don't think very highly of students following this major.	-.18	2: Prestige	-.72
Choosing this major means that I am going to struggle financially in the future.	-.30	2: Prestige	-.64
I'll earn the respect of others if I follow this major.	.25	2: Prestige	.56
This major is not practical.	-.47	2: Prestige	-.54
This major provides the most practical or realistic plan for my future.	.47	2: Prestige	.53
This major will allow me to be successful in my later life.	.57	2: Prestige	.49
Other people in this major are a lot like me.	.36	3: Interpersonal Similarity	.62
I like my classmates in this major.	.55	3: Interpersonal Similarity	.55
I share common goals with my classmates in courses related to my major.	.54	3: Interpersonal Similarity	.45
I don't have any interests in common with my classmates in courses for my major.	-.55	3: Interpersonal Similarity	-.44
I don't get along with other students in this major.	-.56	3: Interpersonal Similarity	-.33
I like the level of interaction with others involved in this major.	.62	3: Interpersonal Similarity	.31
The work involved in this major is too hard.	-.52	4: Effort and Difficulty	.60
I struggle with tasks in the major.	-.56	4: Effort and Difficulty	.59
This major requires too great of a time commitment than I can or am willing to meet.	-.38	4: Effort and Difficulty	.45
I feel "micro-managed" in many aspects of my current major.	-.42	4: Effort and Difficulty	.37
I need to work on my personality to better fit my major.	-.58	4: Effort and Difficulty	.31
I have changed to become more like other students in my major.	-.36	4: Effort and Difficulty	.30

Sometimes it feels like others are more invested in this major than I am.	-.53	4: Effort and Difficulty	.27
I'm not sure I'll be successful in this major.	-.63	4: Effort and Difficulty	.19
This major provides me with deeper insights into myself.	.57	5: Interest	.57
This major makes me a better person.	.55	5: Interest	.47
I am excited about this major.	.75	5: Interest	.44
I have a strong interest in the components of my major.	.73	5: Interest	.39
I gain positive energy when I am engaged in work related to this major.	.74	5: Interest	.37
I'm sticking with this major even though it's hard because I love this major.	.56	5: Interest	.35
This major doesn't have a lot of deeper meaning for me.	-.68	5: Interest	-.34
I feel a sense of satisfaction in my work with this major.	.76	5: Interest	.32
This major has helped me to cultivate new skills.	.61	5: Interest	.28
I like the level of challenge presented by my major.	.58	5: Interest	.21
I am bored (or I expect I will be bored) by tasks required for this major.	-.61	5: Interest	-.20
I have prioritized my work for this major over other things in my life (such as friends, work, student organizations, athletics).	.31	5: Interest	.34
I believe I will succeed at this major.	.78	6: Perceived Competence	.46
I am confident I will complete my degree in this major.	.75	6: Perceived Competence	.29
I think I am (or will be) pretty good at tasks required for this major.	.76	6: Perceived Competence	.26
I have skills that are consistent with my major.	.71	6: Perceived Competence	.24
I believe that I am performing (or will perform) well in my coursework for this major.	.68	6: Perceived Competence	.22
I can achieve success in this major through my own hard work.	.75	6: Perceived Competence	.14
It's better to just let others select a major that would be good for me.	-.62	7: Decision Aversion	.61
I don't want the responsibility of choosing my major; I'd rather have someone else tell me what to choose.	-.64	7: Decision Aversion	.59
I picked a major without giving it much thought.	-.59	7: Decision Aversion	.36
I chose this major to please other people.	-.54	7: Decision Aversion	.25
Other people may have guided me, but the choice of this major was entirely my own.	.52	7: Decision Aversion	-.18

Table 8-5

Correlations between RAMS and Academic Variables: Study 1

RAMS Scales	Personal Intelligence	Overall GPA	GPA in major	Study Major Courses	Absences in Major Courses	Number Major Changes
General:						
Satisfaction with Major	.26*	.15*	.16*	.16*	-.05	.06
Balance & Flexibility	.06	-.01	-.01	.03	.02	-.01
Prestige	-.15*	-.02	<.01	-.16*	-.02	-.05
Interpersonal Similarity	.17*	.09	.09	.10*	-.05	.03
Effort and Difficulty	-.28*	-.23*	-.25*	-.04	.14*	-.03
Interest	.12*	.11*	.12*	.23*	-.03	.01
Perceived Competence	.26*	.21*	.22*	.12*	-.03	.07
Decision Aversion	-.30*	-.08	-.10*	-.08	.04	-.08
Personal Intelligence	--	.13*	.15*	.01	-.09	.16*
<i>M</i>	0.82	3.37	3.44	5.81	3.51	2.51
<i>SD</i>	0.19	0.44	0.44	2.81	4.29	0.89

* $p < .05$

Table 9-1

Correlations between RAMS and Psychological Variables: Study 2.

Measure	Learning Adaptability	HEXACO: Honesty-Humility	HEXACO: Emotionality	HEXACO: Extraversion	HEXACO: Agreeableness	HEXACO: Conscientiousness	HEXACO: Openness
General:							
Satisfaction with Major	.51*	.32*	-.09	.33*	.21*	.33*	.20*
Balance & Flexibility	.22*	.02	-.04	.20*	.12*	.10	.15*
Prestige	.29*	.20*	-.12*	.17*	.09	.17*	.06
Interpersonal Similarity	.36*	.23*	<.01	.28*	.14*	.21*	.11
Effort and Difficulty	-.35*	-.29*	.07	-.30*	-.18*	-.27*	-.14*
Interest	.46*	.22*	-.04	.24*	.25*	.26*	.19*
Perceived Competence	.45*	.26*	-.06	.27*	.18*	.31*	.14*
Decision Aversion	-.29*	-.37*	.11	-.23*	-.01	-.25	-.20*
Personal Intelligence	.23*	.31*	.12*	.16*	.09	.20*	.19*
<i>M</i>	3.71	3.76	3.29	3.79	3.38	3.66	3.53
<i>SD</i>	0.45	0.55	0.63	0.53	0.46	0.49	0.58

All scales measured on a Likert scale from 1 to 5 with higher values indicating more agreement.
* $p < .05$

Table 9-2

Correlations between RAMS and Selected Academic Advising Variables: Study 2

Measure	Advising More than Required	Difficulty Conveying Interests/Concerns	Time Spent in Advising Session
General: Satisfaction with Major	.03	-.29*	.03
Balance & Flexibility	<.01	-.17*	.05
Prestige	.01	-.12*	-.05
Interpersonal Similarity	.04	-.28*	<.01
Effort and Difficulty	.05	.33*	-.02
Interest	.07	-.19*	.08
Perceived Competence	-.01	-.18*	-.01
Decision Aversion	-.05	.24*	-.03
Personal Intelligence	-.06	-.22*	.06
<i>M</i>	2.75	2.55	
<i>SD</i>	1.07	0.92	

All scales except "time spent in advising session" measured on a Likert scale from 1 to 5 with higher values indicating more agreement.

* $p < .05$

Table 9-3

Student Preparation for Academic Advising with RAMS: Study 2

Measure	Think About Courses		Explore Offered Courses		Make List of Courses		Plan Course Schedule		Make List of Questions	
	No (n = 66)	Yes (n = 255)	No (n = 111)	Yes (n = 210)	No (n = 107)	Yes (n = 214)	No (n = 99)	Yes (n = 222)	No (n = 172)	Yes (n = 149)
General: Satisfaction with Major	2.86	3.04*	2.91	3.05*	2.89	3.06*	2.91	3.05*	2.96	3.06*
Balance & Flexibility	2.69	2.83*	2.71	2.84*	2.70	2.85*	2.77	2.81	2.76	2.84
Prestige	2.87	3.03*	2.94	3.03	2.98	3.01	2.95	3.02	2.97	3.03
Interpersonal Similarity	2.90	3.06*	2.94	3.08*	2.91	3.09*	2.94	3.07*	2.99	3.08*
Effort and Difficulty	2.39	2.15*	2.30	2.15*	2.34	2.13*	2.31	2.15*	2.26	2.13*
Interest	2.90	3.07*	2.93	3.08*	2.93	3.08*	2.95	3.07*	2.99	3.08
Perceived Competence	3.06	3.22*	3.09	3.25*	3.06	3.26*	3.08	3.25*	3.15	3.25*
Decision Aversion	1.99	1.74*	1.92	1.73*	1.97	1.70*	1.99	1.70*	1.86	1.72*
Personal Intelligence	0.64	0.75*	0.68	0.75*	0.66	0.76*	0.62	0.78*	0.69	0.77*

All scales measured on a Likert scale from 1 to 5 with higher values indicating more agreement.

* $p < .05$

Table 9-4

Correlations between RAMS and Personal Intelligence and Academic Variables: Study 1

Measure	Personal Intelligence	Overall GPA	GPA in major	Study Major Courses	Absences in Major Courses	Number Major Changes	Consider Major Change ^a	Consider Withdraw or Transfer ^a	Satisfaction with Education ^a	Academic Burnout ^a	Interest-Major Congruence
General:											
Satisfaction with Major	.36*	.22*	.22*	-.08	-.19*	-.12*	-.47*	-.16*	.32*	-.41*	.30*
Balance & Flexibility	.15*	.03	.04	-.22*	-.02	.04	-.06	-.05	.19*	-.25*	.03
Prestige	.20*	.11	.06	.01	-.05	-.13*	-.24*	-.09	.21*	-.24*	.17*
Interpersonal Similarity	.26*	.07	.09	-.03	-.01	-.12	-.27*	-.14*	.24*	-.26*	.23*
Effort and Difficulty	-.34*	-.28*	-.29*	.17*	.20*	<.01	.34*	.11	-.21*	.49*	-.22*
Interest	.19*	.16*	.18*	.02	-.20*	-.14*	-.52*	-.17*	.29*	-.28*	.25*
Perceived Competence	.30*	.25*	.25*	-.09	-.25*	.04	-.44*	-.12*	.23*	-.31*	.24*
Decision Aversion	-.42*	-.15*	-.12*	.05	.09	.12	.24*	.11	-.22*	.24*	-.29*
Personal Intelligence	--	.16*	.19*	-.11	-.11	-.06	-.04	-.08	.19*	-.12*	.19*
<i>M</i>	0.73	3.09	3.14	4.79	3.15	0.48	2.10	1.79	3.89	3.30	.26
<i>SD</i>	0.19	0.54	0.53	2.71	3.02	0.77	1.13	1.06	0.84	.95	.49

^a Measured on a Likert scale from 1 to 5 with higher values indicating more agreement.

* $p < .05$

FIGURES

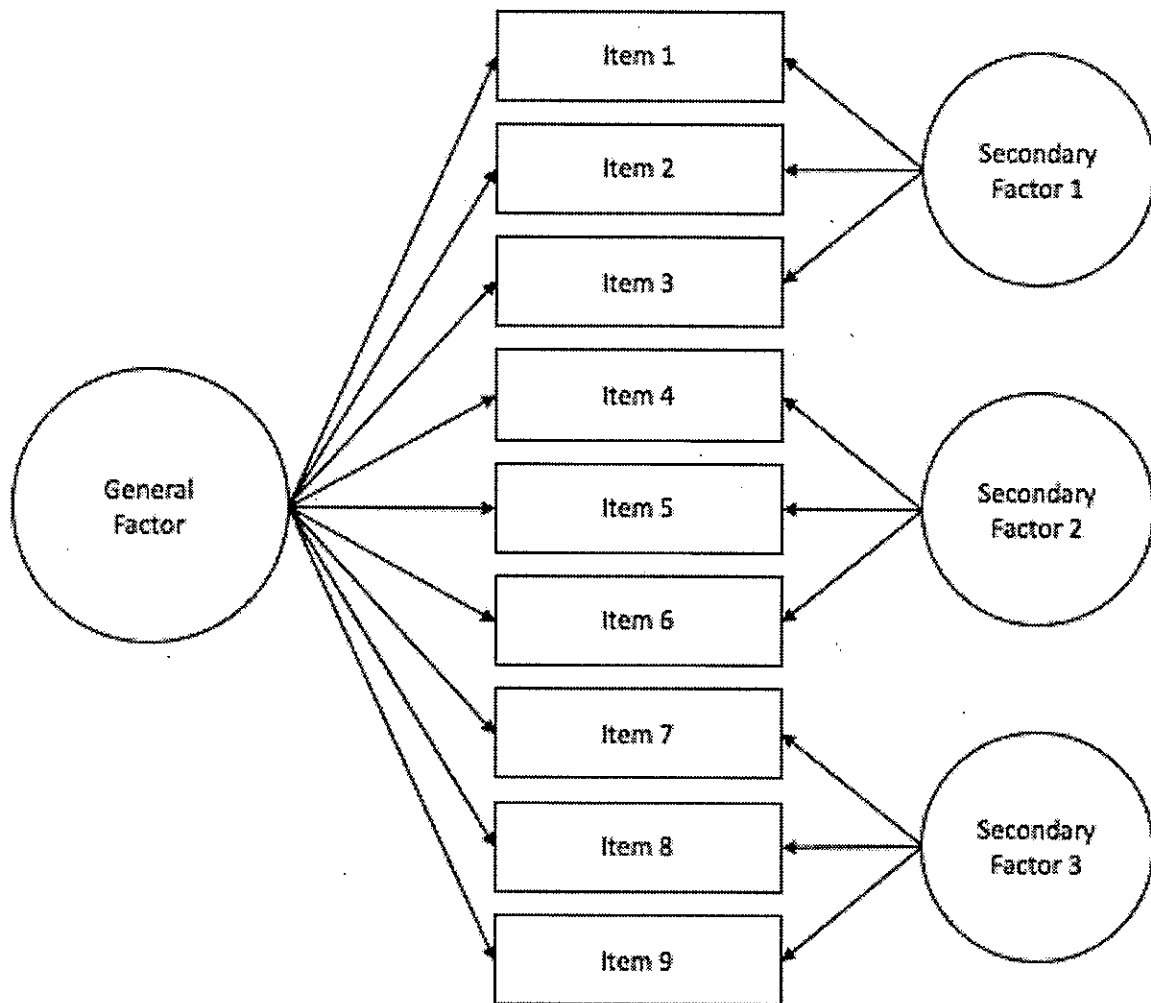


Figure 8-1. Hypothetical depiction of a bifactor model structure.

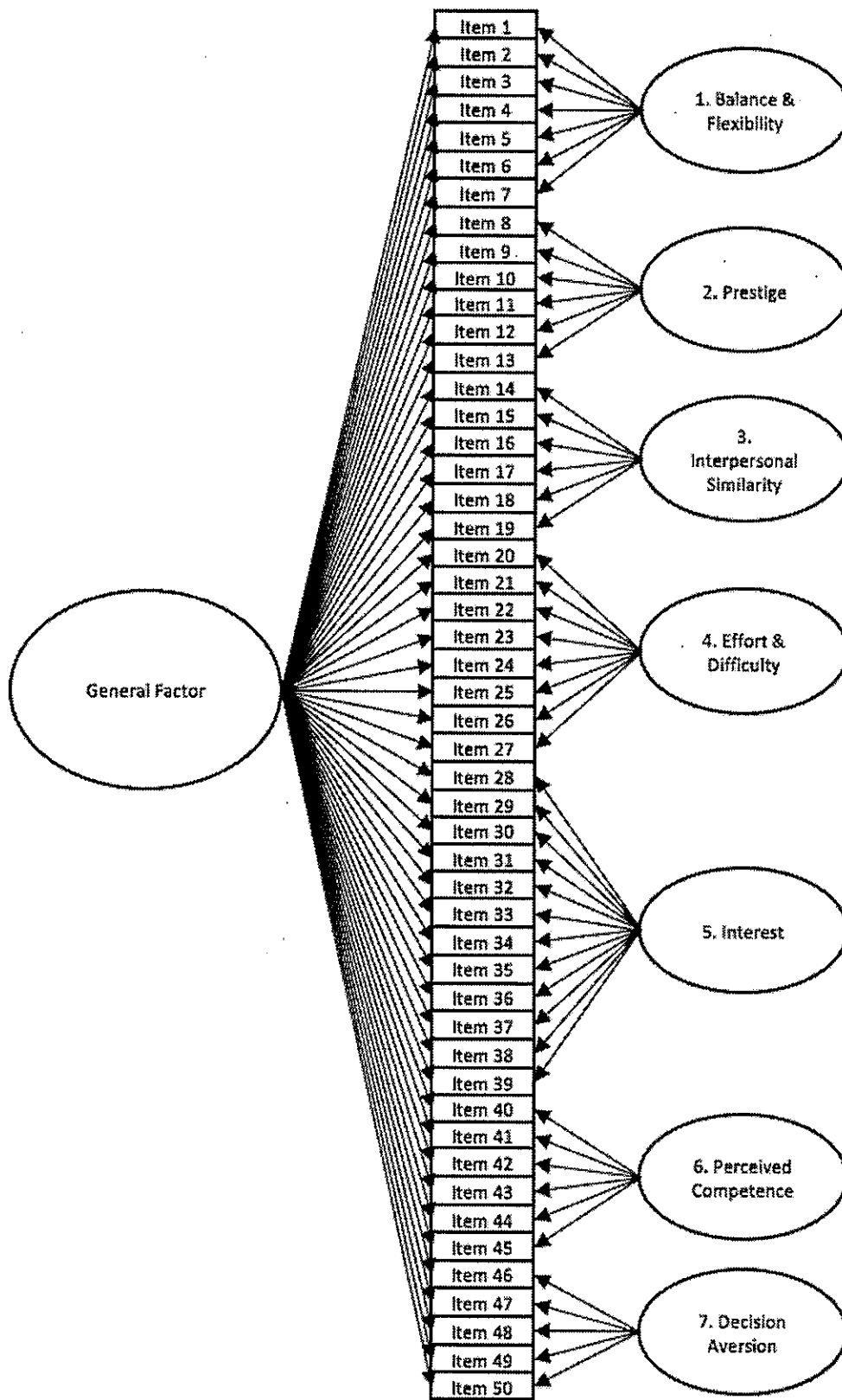


Figure 8-2. Reasoning about Major Scale Bifactor Model

APPENDICES

Appendix A

Sample Lists of Items from Previous Research Assessing Reasons for Students' Choice of Major

DeMarie & Aloise-Young, 2003	<p>Interested in the area Wanted a career in the area Success in the classes One of my parents A lot of prestige High Salary To help others Interest in the classes Liked Children Known People Find a job easily Enjoyed learning Liked the professors Liked the vacation time</p>
Downey et al., 2011	<p>Job security (long term) Job availability (after graduation) Career earnings Opportunity to lead Lifestyle assoc. with major Opportunity to use people skills Opportunity to use communication skills Opportunity to manage business Starting salary Interest in business organizations Opportunity to use creativity Quality of education in major Respect associated with major Work is challenging Opportunity to use technical skills Opportunity to use negotiation skills Opportunity to own a business Prestige associated with major Opportunity to manage people Opportunity to use quantitative skills Opportunity to be part of a team Influence of introductory course in major Perceived degree of difficulty in major Opportunity to manage non-human assets Previous work experience in major University department's reputation Influence of both parents Influence of a college instructor Influence of male parent Influence of female parent Influence of other male working in field Influence of friends or other students Influence of other female working in field Influence of high school teacher(s) Influence of high school counselor(s)</p>
Kim et al., 2002	<p>I am interested in this type of work. Good job opportunities with this major.</p>

	<p>“Good fit” with my abilities. To help me run my own business someday. Projected earnings are favorable with this major. Reputation of this major at my school. Perceived quality of instruction. My parents’ influence. Amount and type of promotional information. My friends’ influence.</p>
Malgwi et al., 2005	<p>Interest in subject Aptitude (skill) in the subject College’s reputation Parent/guardian High school guidance counselor Related subject in high school College open house High school advisor/teacher Potential job opportunities Potential for career advancement Level of pay (compensation) in the field</p>
Marrs et al., 2007	<p>I have a very strong interest in the subject matter of psychology. I enjoy learning about people. Psychology is a good undergraduate degree to prepare me for a graduate or professional degree. I enjoyed my experience in the first psychology course I took in college. I want to become a professional psychologist. The Bachelor’s degree in Psychology will prepare me for a job. I want to figure myself out. A past experience (a traumatic or good experience) influenced me to major in psychology. A career in psychology will lead to a good salary. The opportunity to conduct research. I want to become an academic psychologist. Psychology is a good undergraduate degree to prepare me for teaching. I want to become a professional social worker. I want to become an industrial/organizational psychologist. Psychology is an easy major. One of my high school teachers inspired me to choose this major. A family member encouraged me to go into psychology. My father had a strong influence on my decision to major in psychology. My mother had a strong influence on my decision to major in psychology.</p>
Soria & Stebleton (2013)	<p>Interest in Subject Area Intellectual Curiosity Prepares me for a fulfilling career Prepares Me for Graduate/Professional School Prestige Leads to high paying jobs Provides International Opportunities Allows Time for Other Activities Complements My Desire to Study Abroad Parental Desires Easy Requirements Could not get into my first choice of major</p>

Appendix B

Guiding Questions for Semi-Structured Interviews

Background on major:

- Have you selected a major? [*If 'yes', questions will be geared toward their selected major; if 'no', questions will be directed toward the top two or three majors they are currently considering*]
- What major did you choose?
- Are you in the honors program in your major? Why or why not?
- What is your second major or your minor?
- What relationship do you see between your two majors (or major and minor)?

Making a decision about the major and connecting major choice to the deeper self:

- What was your process of ultimately deciding on your current major? What attracted you to your major? What factors influenced your decision? What was helpful/unhelpful to you in the process of deciding on a major? [Are there other things that would have been helpful?]
- What were some alternatives that you considered? Why did you select this major over other options?
- What signs did you see that you were close to deciding on your major?
- What qualities come to mind of a person who chooses this major? How closely do you think you fit the qualities you described? To what extent do you feel that this is the right major for you? (How does this major fit with your interests and goals?)

Major choice and motivation:

- What are some of the potential (or actual) benefits associated with your major? [how do these compare to benefits associated with other majors you considered?]
- What are some of the potential (or actual) drawbacks associated with your major? [how do these compare to drawbacks associated with other majors you considered?]
- Are others supportive of your choice of major? How are they supportive or unsupportive?
- When you are feeling unmotivated to make progress on academic work related to your major, what helps you get back on track?

Commitment to major:

- What have you done recently that reflects your commitment to this major (or concern over whether it is right for you)?
- Have you talked to your professors about delving more into your major (e.g., by helping out in a lab or taking on a special arts program, or writing fiction in your spare time for English)?
- What are some other activities (discussions, talks, clubs) you have engaged in over the past days weeks or months that reflects your commitment to your major? What about activities that indicate you'd rather be doing something else?

Closing:

- Is there anything else you think would be helpful for me to know about your process of selecting a major?

Appendix C

Initial Items for Students' Decision Process for Selecting a Major

Choice Exploration

1. I was aware of all my options prior to selecting a major
2. I weighed out options and took several classes (making comparisons with others) before choosing this major
3. I picked a major without giving it much thought (R)
4. I never looked into/thought about other options (R)
5. There aren't any drawbacks to this major (R)
6. It would be a hassle/a lot of work to change majors (R)
7. I'm not ready to select a major yet
8. It's better to just let others select a major that would be good for me (R)
9. I understand the drawbacks associated with this major, but I still want to pursue it
10. I came to college to figure out what I want to do for the rest of my life.

Confidence

1. I have skills that are consistent with this major
2. The work involved in this major is too hard (R)
3. I'm not sure I'll be successful in this major (R)
4. I struggle with tasks in the major (R)
5. I believe that I am performing (or will perform) well in my coursework for this major.
6. I think that I am (or will be) pretty good at tasks required for this major.
7. I believe I will succeed at this major

Commitment, Persistence, & Focus

1. I'm sticking with this major even though it's hard because I love this major
2. I do not have many interests besides the major I am currently pursuing (R)
3. I have prioritized my work for this major over other things in my life (e.g., friends, work, student organizations, athletics)
4. I am confident I will complete my degree in this major
5. If this major posed too many challenges, I would switch majors (R)
6. It is quite possible that I will quit this major (R)
7. This major requires too great of a time commitment (R)
8. It wouldn't be a big deal to change my major (R)
9. I don't know what else I would do if I wasn't pursuing this major

Personal Growth

1. This major has helped me to cultivate new skills
2. This major doesn't have a lot of deeper meaning for me (R)
3. I don't think this major will help me grow as a person (R)
4. I like the level of challenge presented by my major
5. This major makes me a better person
6. This major provides me with deeper insights into myself

Extrinsic-Intrinsic Motivation I: Valuing the Work

1. It is more important that I enjoy what I do than it is to make a lot of money
2. I have a strong interest in the components of my major
3. It is more important that I make a lot of money than to enjoy what I do (R)
4. I am bored (or I expect I will be bored) by tasks required for this major (R)
5. I gain positive energy when I am engaged in work related to this major
6. I feel a sense of satisfaction in my work with this major
7. My work in this major often feels pointless or trivial (R)
8. I could see feeling burnt out in this major (R)
9. I am excited about this major.

Extrinsic–Intrinsic Motivation II: Autonomy Afforded by the Major

1. I can achieve success in this major through my own hard work.
2. I feel “micro-managed” in many aspects of my current major. (R)
3. There is very little flexibility on the path toward completing my major (R)
4. Success in this major is a matter of luck or who you know (R)
5. This major allows me (or will allow me) to make my own decisions about my coursework.
6. This major allows me to have a flexible schedule to pursue my interests within this area.

Extrinsic–Intrinsic Motivation III: External Pressures v. Autonomous Decision-Making and Autonomous Support

1. Other people may have guided me, but the choice of this major was entirely my own
2. Sometimes it feels like others are more invested in this major than I am (R)
3. Others express disbelief that I will pursue this major long-term (R)
4. Others encouraged me to choose the major that was best for me
5. I don’t want the responsibility of choosing my major; I’d rather have someone else tell me what to do. (R)
6. I’ll earn the respect of others if I follow this major (R)
7. I chose this major to please other people (R)
8. Other people just want me to choose a major that makes me happy (they don’t care what major I choose)

External Rewards

1. I’ll earn a lot of money if I pursue this major
2. This major will allow me to be successful in my later life
3. This major is not practical (R)
4. Choosing this major means that I am going to struggle financially in the future (R)
5. People don’t think very highly of students following this major and the career path (R)
6. This major is very prestigious
7. This major provides the most practical or realistic plan for my future

Matching People and Interests

1. I share common goals with my classmates in courses related to my major
2. Other people in this major are a lot like me
3. I don’t get along with other students in this major (R)
4. I don’t have any interests in common with my classmates (R)
5. I am very different from other students in my major (R)
6. I like my classmates in this major
7. I have changed to become more like other students in my major (R)

Fit with Self

1. This major is not a good fit with who I am (R)
2. I need to work on my personality to better fit my major (R)
3. This major makes me feel like I am escaping who I am (R)
4. I like the level of interaction with others involved in this major
5. This major allows me to be myself
6. My personality is compatible with my major

Fit with Other Plans

1. This major allows me to balance school with other aspects of my life (e.g., to pursue other interests or activities)
2. The job I would get with this major would not allow me to balance work with other aspects of my life (R)
3. With this major, it will be harder for me to achieve other goals I have (R)
4. This major will allow me to fulfill other goals I have in my life

Note. Items marked with an R indicate that the item is reverse-coded.

Appendix D

Academic Correlates

- How many times have you officially changed your major?
- How many semesters into your college education did you declare your current major?
- What is your overall GPA? (If you don't know exactly, please make your best guess)
- What grades do you receive most commonly in your courses overall?
- What is your GPA in your major/intended major? (If you don't know exactly, please make your best guess)
- What grades do you receive most commonly in courses for your major or intended/possible major?
- On average, how many hours per week do you spend studying/preparing for a course in your major or intended/possible major? [estimate average per course]
- On average, how many hours per week do you spend studying/preparing for a courses not in your major or intended/possible major? [estimate the average per course]
- How many courses have you taken at UNH? [include courses you are currently enrolled in]
- How many courses in your major or intended/possible major have you taken at UNH? [include courses you are currently enrolled in]
- Do you plan to take more than the required courses for your major?
- Are you considering transferring or withdrawing from UNH?
- During last semester, how many classes did you miss, on average, for courses in your major or intended/possible major? [average per course]
- During the last semester, how many classes did you miss, on average, in courses not in your major or intended/possible major? [average per course]

Appendix E

Academic Advising Questions

Which of the following best describes the majority of academic advising you have received this academic year? ¹¹

- Advised individually by assigned advisor at Hood House.
- Advised individually by any available advisor at Hood House.
- Advised individually, through the department of my declared major.
- Advised individually, through a department that is NOT of my declared major.
- Advised in a manner other than the alternatives described above
- No advising received

Approximately how much time is generally spent in each advising session? ¹

- Less than 15 minutes
- 15-30 minutes
- 31-45 minutes
- 46-60 minutes
- more than 1 hour

Why do you typically meet with your advisor?

- To get my RAC number
- To discuss options for my major
- To discuss requirements of my major
- To discuss my course schedule/specific classes
- To sign paperwork

Prior to my advising appointment, typically I:

- Do nothing
- Think about courses I want to take
- Explore the courses being offered
- Make a list of a few courses I am interested in
- Plan out my schedule for the next semester
- Make a list of questions that I have

Which of the advising or career tools have you ever utilized? (select all that apply)

- The "Explore UNH Majors" tool
- Read about potential careers associated with the major
- Completed the Jackson Career Interest Explorer
- Walk-in workshops
- 7-week advising seminar
- Student 4-Year Planner
- Wildcat Careers
- Career and internship Fair

[1-5 Disagree/Agree]

My advisor should create my schedule for me.

I would rather go to the walk-in time than schedule an appointment with my advisor.

Advising services are a waste of my time.

I generally wait until absolutely necessary to meet with my advisor.

I have met with my advisor more than required.

I feel confident in my ability to navigate the university.

I am motivated to make the most of my time at college.

It is difficult for me to convey my interests and/or concerns to my advisor.

I feel overwhelmed by my experiences at the Advising and Career Center.

I would not want to take a class that doesn't count toward my degree requirements.

I am interested in taking courses outside my major(s) and the discovery program.

I am not or plan to complete a minor.

¹¹ Items taken from Winston & Sandor (2002)

Appendix F

Final RAMS Items Grouped by Secondary Factor

Balance and Flexibility

- This major allows me to balance school with other aspects of my life (so I can pursue other interests or activities).
- This major allows me to have a flexible schedule to pursue my interests within this area.
- It wouldn't be a big deal to change my major.
- There is very little flexibility on the path toward completing my major. (R)
- This major allows me (or will allow me) to make my own decisions about my coursework.
- This major will allow me to fulfill other goals I have in my life.
- Other people just want me to choose a major that makes me happy (they don't care what major I choose).

Prestige (RG)

- People don't think very highly of students following this major. (R)
- Choosing this major means that I am going to struggle financially in the future. (R)
- I'll earn the respect of others if I follow this major.
- This major is not practical. (R)
- This major provides the most practical or realistic plan for my future.
- This major will allow me to be successful in my later life.

Interpersonal Similarity

- Other people in this major are a lot like me.
- I like my classmates in this major.
- I share common goals with my classmates in courses related to my major.
- I don't have any interests in common with my classmates in courses for my major. (R)
- I don't get along with other students in this major. (R)
- I like the level of interaction with others involved in this major.

Effort and Difficulty (RG)

- The work involved in this major is too hard.
- I struggle with tasks in the major.
- This major requires too great of a time commitment than I can or am willing to meet.
- I feel "micro-managed" in many aspects of my current major.
- I need to work on my personality to better fit my major.
- I have changed to become more like other students in my major.
- Sometimes it feels like others are more invested in this major than I am.
- I'm not sure I'll be successful in this major.

Interest

- This major provides me with deeper insights into myself.
- This major makes me a better person.
- I am excited about this major.
- I have a strong interest in the components of my major.
- I gain positive energy when I am engaged in work related to this major.
- I'm sticking with this major even though it's hard because I love this major.
- This major doesn't have a lot of deeper meaning for me. (R)
- I feel a sense of satisfaction in my work with this major.
- This major has helped me to cultivate new skills.
- I like the level of challenge presented by my major.
- I am bored (or I expect I will be bored) by tasks required for this major. (R)

- I have prioritized my work for this major over other things in my life (such as friends, work, student organizations, athletics).

Perceived Competence

- I believe I will succeed at this major.
- I am confident I will complete my degree in this major.
- I think I am (or will be) pretty good at tasks required for this major.
- I have skills that are consistent with my major.
- I believe that I am performing (or will perform) well in my coursework for this major.
- I can achieve success in this major through my own hard work.

Decision Aversion (RG)

- It's better to just let others select a major that would be good for me.
- I don't want the responsibility of choosing my major; I'd rather have someone else tell me what to choose.
- I picked a major without giving it much thought.
- I chose this major to please other people.
- Other people may have guided me, but the choice of this major was entirely my own. (R)

Note. Items marked with an R indicate that the item is reverse-coded when calculating the secondary factor. Secondary factors marked with RG indicate that the items within that factor are scored in reverse for calculating the general factor.

