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The Role of Noncognitive Constructs and Other Background Variables in Graduate Education

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Abstract

This report reviews the literature on noncognitive and other background predictors (e.g., personality, attitudes, and interests) as it pertains to graduate education. The first section reviews measures typically used in studies of graduate school outcomes, such as attrition and time to degree. A review of qualities faculty members and administrators say they desire and cultivate in graduate programs is conducted. There appears to be a divergence between the qualities faculty members say are important and the measures researchers typically use in validity studies.

The second section reviews three categories of noncognitive variables that might predict outcomes (general personality factors, quasi-cognitive factors, and attitudinal factors) and the definitions, measures, correlates, and the validity of those measures. The role of background factors, both environmental and group, is part of this review.

Key words: noncognitive, personality, admissions, GRE[®], selection, assessment, new constructs

Executive Summary

Many GRE® studies conducted in the past several years have asked faculty members about the qualities that are important to success in graduate school. A consistent finding is that graduate faculty members believe that noncognitive factors, such as motivation, creativity, personality, interests, and attitude, ought to be considered in graduate admissions (e.g., Briel et al., 2000). Many faculty members believe that including such factors would increase both fairness and the validity of the current admissions process. At the same time there is a lack of knowledge about what the scientific literature says on what the noncognitive factors are, how important they are, how they could best be measured, and on whether it might be practical to use them in admissions decisions. The purpose of this review is to address these questions. This report reviews various noncognitive factors and definitions, measures, correlates, and the validity of those measures.

Graduate School Outcomes and Their Determinants

A notional path model illustrates the relationships between noncognitive *predictor* factors and graduate school *outcome* factors. Graduate school outcome factors are divided into traditional measures of convenience and performance factors. Traditional measures are attrition, time-to-degree, and grade point average. Performance factors are domain proficiency, general proficiency, communication, effort, discipline, teamwork, leadership, and management. The noncognitive predictor factors are divided into three main categories: personality (e.g., extroversion), quasi-cognitive (e.g., metacognition), and motivation factors (e.g., self-efficacy). In addition, there are two background categories assumed to affect the noncognitive factors: environmental (e.g., mentor support) and group factors (gender and ethnicity). The review is organized according to this model.

Personality Factors

A consensus has emerged within the field that there are five major personality factors: extroversion, emotional stability, agreeableness, conscientiousness, and openness. Other personality factors appearing in the literature can be seen as combinations or facets (narrower subfactors) of these.

The advantages of including personality in graduate admissions review are that doing so would broaden the qualities considered and increase ethnic diversity. Faculty members say

personality is important. The problem is that personality is measured through self-reports and is therefore fakable. The literature suggests techniques to control faking (e.g., adjust scores for social desirability bias, use forced choice, warn examinees not to fake, use subtle items) but these have not been tried in large volume, high stakes settings. The techniques would likely fail under such circumstances because coaching could be developed to overcome them.

There are two ways personality could be introduced into graduate admissions. One is through the use of a performance (ability) test for measuring personality, which could be immune to faking. One new method that may have promise is the *conditional reasoning* approach, which involves items that look like reasoning items, but contain more than one correct answer, the choice of which is thought to reflect personality. This approach is too new to have been evaluated sufficiently. Another way is through the use of others' rating of personality—advisors, professors, and other members of the college community who typically write letters of recommendation for students now.

Quasi-Cognitive Factors

These are factors that are often considered somewhere in between cognitive and noncognitive factors. They may be measured with performance tests, or ability tests, but they also reflect affective qualities. The review considers four such factors: creativity, emotional intelligence, metacognition and confidence, and cognitive style.

Creativity

Creativity typically ranks high on the list of qualities faculty say are important to success in graduate school. However, people disagree on what exactly it is, and on how it ought to be measured. Self-reports tend to be obvious, and easily faked. Performance measures, such as fluency tests (e.g., "How many ways can you use a brick?") tend not to predict important criteria, independently of general cognitive ability. Creativity has been assessed by others' judgments, as overall ratings of the person, or as ratings of particular creative products (e.g., essays). Whether such ratings are independent of other quality judgments has not been established, but such an approach illustrates that creativity could be and has been used as an outcome (criterion) variable as well as a predictor.

Emotional Intelligence

Emotional intelligence has received considerable attention in the popular media and some attention in scientific literature. Measures fall into two categories: self-reports and performance tests. Self-reports yield scores that duplicate personality measures, and they have the same problems as personality measures—they are fakable. Performance tests are possibly a different story. They have not been studied sufficiently, but they offer the promise of not being fakable. However, little is known about their validity.

Confidence, Metacognition

These are measures that assess whether examinees can accurately predict whether they know the correct answer to a test item. There has been considerable research suggesting that one's ability to predict is independent of one's ability per se. However, it is not clear how this could be used in applied admissions contexts. A possible application might be to teach more accurate self-monitoring, which could be considered both a study and test-taking skill.

Cognitive Style

Considerable research has been conducted on cognitive styles such as field-dependence, but there have been problems in discriminant validity (e.g., overlap with cognitive ability or personality). Also, for some cognitive styles, those based on self-reports, fakability probably precludes their use in admissions.

Attitudinal Factors

Attitudinal factors influence choice of activities, goals, strategies, effort, and persistence. For this review, attitudinal factors are self-concept, self-efficacy, motivation, attributions, and interests, and social attitudes. Attitudes are often domain specific. For example, being motivated in one domain, such as academics, may be largely independent from being motivated in another, such as athletics. Attitudinal factors are thought to be particularly important in understanding students traditionally underrepresented in graduate programs.

Self-Concept and Domain Identification

This refers to the way people characteristically think about themselves in a domain. The focus here is on academic self-concept, and identification with the academic domain. Self-views and values determine the importance one puts on achieving and on the behaviors one engages in.

Many factors influence self-concept, including background experiences, race, and gender. Self-concept is typically measured with self-assessments, but a measure called the implicit association test could possibly be used as a self-concept measure.

Self-Efficacy

This widely researched construct refers to one's belief in one's ability to achieve success in a particular area. Self-efficacy is important in selecting goals, adopting strategies, task persistence, and the effort put into a task. High self-efficacy is associated with a wide range of positive academic outcomes. Self-efficacy can be influenced by numerous causes, such as domain mastery, faculty support, personality, and interests. There are many programs designed to increase self-efficacy in a variety of areas, in addition to academic ones.

Motivation

The term *motivation* has been used in many different ways over the years, which makes it difficult to pin down as a psychological construct. Much of the motivation research literature falls into other categories (e.g., self-efficacy), but there are a few concepts associated with the topic of motivation per se. One is the distinction between extrinsic and intrinsic motivation, with intrinsic motivation widely believed to be related to higher outcomes, a belief not supported by recent meta-analytic research. Another is the distinction between a performance- and a learning-goal orientation, with the success of the orientation depending on one's ability (performance goals work well when one is proficient; otherwise, learning goals work better).

Interests

A dominant framework for studying interests is Holland's (1959, 1973) six dimensions scheme, which identifies realistic, artistic, investigative, social, enterprising, and conventional interests. Numerous studies have shown links between interests and academic outcomes. There are gender differences in interests (men higher in realistic; women higher in social and artistic), which undoubtedly accounts for some of the differences in what graduate fields of study men and women pursue.

Attributions

We habitually attribute cause for successes and failures to others, stable or unstable circumstances, or ourselves and to forces under our control or not under our control. Adaptive attribution styles (e.g., attributing failures to ourselves, but also to forces we can control, and that are changeable) leads to greater persistence and intensity in performing tasks, and therefore may be of considerable value in higher education achievement.

Social Attitudes and Values

There have been several proposals for the structure of beliefs, attitudes, and values, such as individualism, equality, and religiosity. These have primarily been studied in cross-cultural contexts, comparing countries with each other, and relating these to national indicators such as GNP and literacy. However, it may be that social attitudes and values are also useful to study at the individual level, as they pertain to success in higher education.

Environmental Influences on Graduate School Outcomes

This section is a discussion of variables other than personality and motivation that may affect performance in graduate school.

Mentor and Social Support

Mentor and social group support affect persistence to degree, as well as other less tangible outcomes such emotional well-being. Informal contact with one's mentor, and mentor qualities such as interest in the student, accessibility, integrity, reliability, and communication skills are important for various graduate school student outcomes.

Prejudice and Institutional Integration

Encountering negative stereotypes about the intelligence or abilities of one's gender, ethnic, or age group may have negative effects on attitudes and school and test performance. There have been numerous demonstrations in the laboratory of such effects, but few in actual higher-education settings. One way prejudice may impair school performance is by inhibiting integration into the university environment, leading to attrition. There have been various programs and policies designed to increase integration, particularly for female and Black students.

Financial Support

Financial support reduces attrition and leads to better dissertations, but it is not equally available to all. There is controversy over whether fellowships or assistantships are more effective, with two major research studies coming to different conclusions.

Prior Accomplishments

Prior accomplishments, as reflected in transcripts, resumes, and standardized surveys, predict graduate school accomplishments, and various undergraduate criteria. Although not widely researched, self-assessed standardized accomplishments measures, particularly when verifiable, have proven useful and may warrant further evaluation.

Group Factors

Black, Hispanic, and female students have lower participation, PhD candidacy, and graduation rates than White and male students. Issues are what factors are responsible and what might be done about it.

Ethnicity

Several explanations have been invoked to account for lower standardized test scores and higher attrition and lower performance in school of Black and Hispanic students. One is stereotype threat, which causes disidentification from the academic domain. Another is systemic, which affects identify development. Academic preparation is lower for Black and Hispanic students, as indicated by high school science and mathematics courses, and the selectivity of colleges attended. To some degree, faculty support, financial aid, and institution policies may combat these effects, as might consideration of a broader range of factors in admissions decisions.

Gender

The gender gap is closing, but differences remain in science, mathematics, and engineering, and in standardized test scores. Some of these differences reflect different interests between genders. Differences in academic preparation are rapidly closing, particularly in high school. Some of the difficulties women experience in mathematics and science may be reduced by considering a broader range of factors in admissions, coupled with institutional and faculty

support. But the downside of diminished peer respect for abilities of those in support and preferential programs has been noted.

Summary

The purpose of this review was to consider the role played by noncognitive factors in graduate school, and how such factors could be used, particularly in graduate admissions. Several recent studies sponsored by the GRE® program have surveyed faculty to identify the qualities they value in admissions and as program outcomes. The information is summarized here and the research literature about those qualities—what they are, how they are measured, what they are related to, and whether they predict educational success is explored. Based on the findings, there are specific opportunities in noncognitive assessment for graduate education available to pursue now. We exclude from consideration the simple adoption of personality and motivation self-assessments due to the threat of coaching and fakeability. But there are other ways noncognitive variables might be used. In admissions, one can imagine using noncognitive variables in the creation of a guide for writing or interpreting letters of recommendation. Current findings suggest dimensions, items, and approaches for such an endeavor. There also may be some performance-based personality, attitude, and emotional intelligence measures that could prove useful in admissions applications, and that merit further research. Outside of admissions, a possible application is guidance where noncognitive information could be used to help students find compatible graduate study programs. A third possibility is using noncognitive constructs as graduate school outcome measures, which could support an institution's efforts to both analyze and promote its programs.

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Overview

Is there a role for noncognitive variables—personality, motivation, self-efficacy, life experiences and accomplishments—in graduate admissions? Many in the graduate education community believe so. Graduate admissions staff interviewed in the recently concluded Horizons project (Briel et al., 2000) frequently mentioned the need for noncognitive indicators to augment the cognitive measures of the GRE. A recent meta-analysis of the validity of the GRE also concluded that improved validity of graduate student selection would only come about by including noncognitive variables such as personality and interests (Kuncel, Hezlett, & Ones, 2001). Outside of higher education—in industry and the military—there is a widespread belief that a major breakthrough in further progress on predicting success in education, training, and performance settings will involve considering noncognitive factors (Hough, 2001; Schmidt, 1994).

Interest in the role of factors other than strictly cognitive ones in higher education is long standing. Over the years there have been many conceptual and empirical investigations of noncognitive factors. With few exceptions this interest has not led to large-scale development of new assessments that might be used in admissions or guidance.

What is different now? One difference is that after an initial flurry of activity related to new possibilities for incorporating cognitive psychology in mental testing (e.g., Sternberg, 1977), a failure to find factors other than general cognitive ability to predict learning outcomes led to a period of stagnation in the field. Many researchers concluded that advances in our ability to predict learning outcomes would have to come from outside the cognitive realm (Schmidt, 1994). A second factor is that for many years, a predominant view in psychology was that situational factors were more important than personal ones in governing behavior (Mischel, 1977). The concept of personality itself was questioned, and by some, even considered illusory. The rediscovery of the five factor model (Goldberg, 1992), and demonstrations of its robustness across cultures and language groups, opened the door to renewed theorizing about personality, and made the 1990s a kind of golden decade of personality research. A third factor might have been the publication in 1995 of the enormously successful book, *Emotional Intelligence*, which sold over 5 million copies, appeared as a cover story in *Time* and *Newsweek*, and whose author, Daniel Goleman, was a highly sought after guest on popular television and radio shows (Goleman, 1995). The book's message was that there is more to success than intelligence. And finally, researchers from various circles began expressing the idea that it was important to consider a wider range of criteria. For example,

Sternberg (1986) argued that there were several dimensions of success, including creative and practical as well as analytic intelligence. Campbell, McCloy, Oppler, and Sager (1993) provided evidence for multiple criterion performance dimensions in military and organizational settings, a topic to which we return shortly.

Purpose of This Review

The purpose of this review is twofold. First, there is an exploration of definitions of graduate student success. The review considers what qualities graduate faculty look for in students during the admissions process and beyond. Second, a review of noncognitive factors that might affect success in graduate school is undertaken. Consideration of both how those factors are measured and how they relate to graduate school success follows.

Organization of This Review

The dividing factors are in three groups: background predictor factors (group and environmental factors), noncognitive predictor factors (personality, attitudinal, and "quasi-cognitive" factors), and outcome criterion factors (convenience and performance measures, and affective factors). Figure 1 illustrates a tentative model of the relationships among these.

This report proposes that personality, attitude, and quasi-cognitive factors directly affect graduate school outcomes. Background factors affect graduate school outcomes indirectly, through attitude. There are also group differences in personality and the quasi-cognitive factors. The model is tentative, based not on a systematic meta-analysis, but on an initial understanding of how these factors interact. There are testable alternatives to this model, such as allowing direct effects of background factors on outcomes, or allowing paths between subfactors rather than groups of factors. Nevertheless there is benefit to this as a starting point.

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Graduate School Outcome Factors

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Graduate school outcomes that receive the most attention, in admissions offices and among researchers, are attrition, time to degree, and student quality. The latter is measured by faculty ratings, grade point average (first year and overall), and scores on comprehensive examinations. The reason for their prominence is partly convenience—colleges keep these sorts of records for a variety of purposes; it is easy to retrieve them and discuss them. But all have their problems. Grade point average, despite being the most widely used, lacks standardization

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across schools, degree programs, and individual faculty members. Ratings similarly lack standardization. Attrition and time to degree are complex variables with many, varied determinants. For example, a student might drop out due to a family illness or a job opportunity. Are these the right measures of graduate school outcomes? How important are they to the graduate community? What factors does the graduate community value?

Background factors   Noncognitive factors   Outcome factors

Personality factors

Extroversion
Emotional stability
Agreeableness
Conscientiousness
Openness and intellect

Environmental factors

Mentor support
Social support
Stereotypes/prejudice
Integration into school
Nonacademic demands
Financial support
Prior accomplishments

Group factors

Gender
Race

Attitudinal factors

Self-concept
Self-efficacy
Motivation
Attributions
Interests
Social attitudes/values

Quasi-cognitive factors

Creativity
Emotional intelligence
Cognitive style
Metacognition

Convenience measures

Grade point average
Exams
Ratings
Attrition
Time to degree
Productivity

Performance factors
Domain proficiency
General proficiency
Communication
Effort
Discipline
Teamwork
Leadership
Management

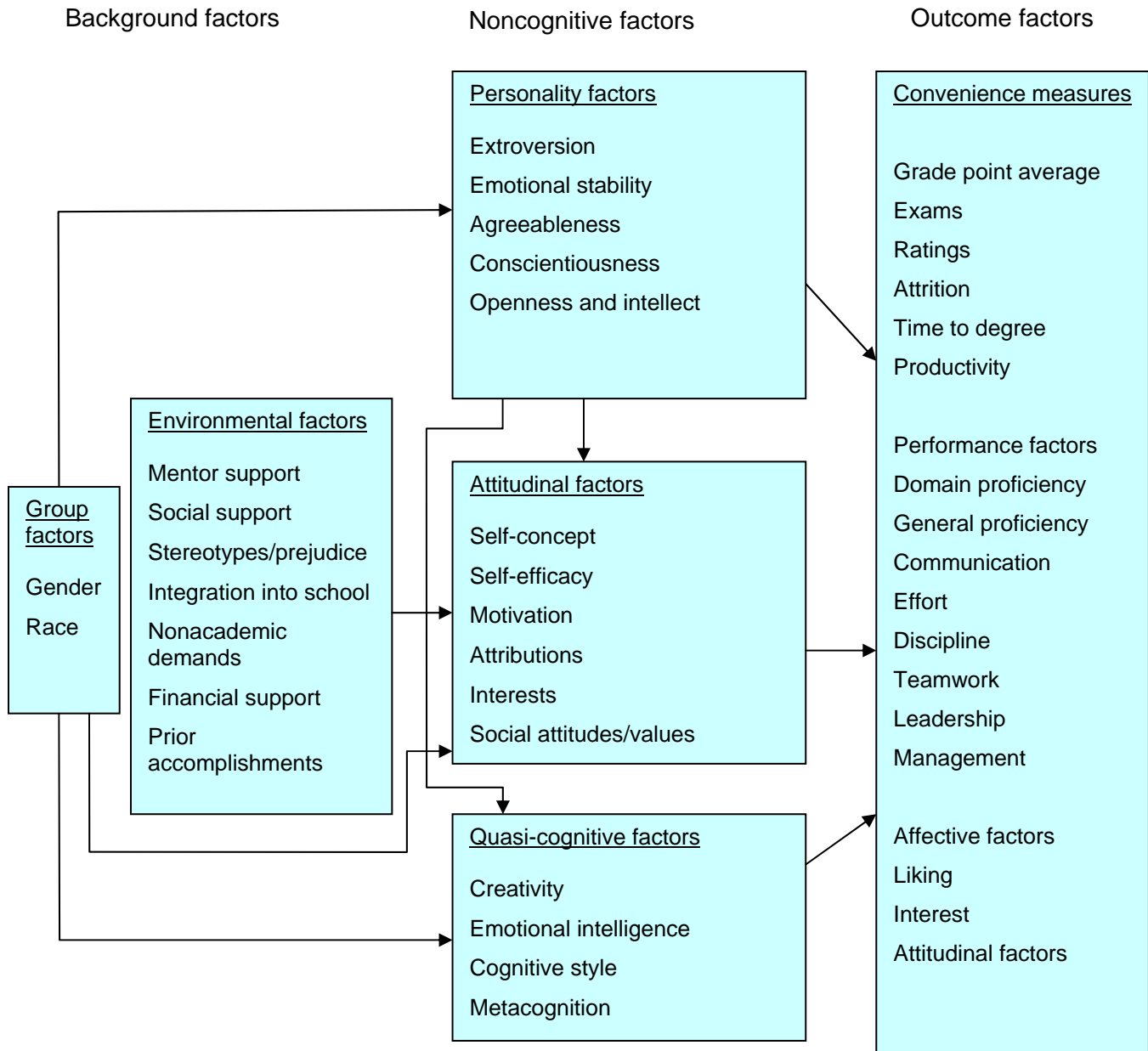Affective factors
Liking
Interest
Attitudinal factors

Figure 1. **Tentative model of the relationships among background predictor, noncognitive predictor, and outcome criterion factors.**

Indicators of Graduate School Success

There have been several formal studies of graduate school outcomes to address these issues in recent years, based on interviews conducted with faculty and administrators.

Graduate school competencies project. Enright and Gitomer (1989) interviewed 15 "noted scholars and mentors with direct experience in graduate teaching" (p. 2), with the goal of identifying competencies important for graduate school success. As a result of two sets of interviews (over the phone, and a follow-up group discussion), and a review of the literature on graduate school criteria, Enright and Gitomer identified "seven general competencies." These, with definitions and examples, are listed in Table 1. Note that these are outcome success criteria in that they are competencies graduate faculty would like to see in their students. Some of these competencies might be knowable, to some extent, prior to an admissions decision. For example, undergraduates write reports, display creativity, develop logical arguments, go beyond the minimum, design experiments, display social skills, and function independently. But the important point is that they are the competencies graduate faculty accept as outcomes and indicators of success in graduate school.

The first two competencies, and maybe the first three, all seem to be essentially cognitive, and closest to what the GRE currently measures. The next one—communication— starts moving away from the current GRE (although it may be reflected in the new essay assessment). The remaining others are more distinct and noncognitive in nature.

Horizons project. More recently, as a follow-up to the Horizons project (Briel et al., 2000), and as part of a larger study on GRE validity, researchers conducted lengthy telephone interviews with 16 faculty members and five deans from five institutions, including both doctoral and masters institutions, and including one Hispanic-serving institution and one historically Black college or university (HBCU) (Walpole, Burton, Kanyi, & Jackenthal, 2001). A purpose of the interview was to query respondents for definitions of successful graduate students. In open-ended discussions, a total of 36 attributes were mentioned by the 21 interviewees, and the authors scored the attributes by characterizing how they were talked about as either enthusiastic (3 points), moderate (2 points), or conditional (1 point). No mention of any of these resulted in zero points awarded. Some variables were talked about in relation to admissions, others to outcomes, and some, to both. Table 2 presents the list of 21 attributes mentioned in relation to outcomes, sorted

by their average score (the total number of mention points divided by 21, the number of interviewees). An analysis of mentions in regards to admissions will be presented later.

A noteworthy finding is the number of noncognitive attributes mentioned in Table 2. Some indeed are mentioned quite frequently—persistence (1.48), collegiality (1.38), and communication (1.14), were among the most frequently mentioned outcomes, even more frequently mentioned than mastery of the discipline (1.00) and ability to teach (.62).

Table 1

Enright and Gitomer: Seven Important General Competencies

Competency	Definition	Examples
Explanation	Giving a reason or cause for some phenomenon or finding	Produce alternative hypotheses, analogical reasoning, develop logical argument, defend ideas
Synthesis	Skills that facilitate the development of expert domain-knowledge structures	Master content and skills in a field, function independently, manipulate knowledge creatively
Creativity	Produce unusual ideas, generate novel ideas	Intellectual playfulness, rebelliousness—criticize, modify facts, theories
Communication	Ability to share ideas, knowledge, and insights with others	Write reports, give presentations, discussions with others
Motivation	Commitment, involvement, interest in work	Persistence, enthusiasm, excitement, go beyond minimum
Planning (self-organization)	Developing a procedure to reach a goal	Design an experiment, organize a paper, make career decisions
Professionalism (social)	Skills in accommodating to social conditions in field	Social skills, joining professional societies, informal discussions with faculty and students

Table 2

Mean Importance Ratings of Outcomes of Open-Ended Discussions

Variable	Mean rating
Research/scholarly experience (amount and quality)	1.52
Persistence/tenacity	1.48
Collegiality/making professional connections/networking	1.38
Communication (professional)	1.14
Mastery of discipline	1.00
ESL ability	0.71
Ability to teach	0.62
Independence	0.43
Creativity: ability to think "out of the box"	0.43
Enthusiasm	0.43
Ability to read and analyze research in the field	0.43
Values/character: integrity, fairness/openness/honesty, trustworthiness/consistency—personal and professional	0.29
Breadth of perspective	0.29
Open mindedness	0.29
Opportunism/resourcefulness	0.29
Critical thinking ability, logic, problem solving ability	0.14
Drive/commitment/motivation/zeal	0.14
Computer literacy/understand and manage technology	0.14
Skill in investigation	0.14
Ability to find the facts: information gathering	0.14
Professional posture	0.14

Note. Importance rating is the mean mention level of the variable across the 21 participants, where 0 = not mentioned, 1 = conditional mention, 2 = moderate mention, 3 = enthusiastic mention (from Walpole et al., 2001, Table 1); therefore higher ratings indicate greater endorsement.

A taxonomy of higher order performance components. It would be useful to categorize this list of attributes. A well-established scheme for classifying outcome or criterion variables is the *taxonomy of higher order performance components* (Campbell et al., 1993). This work resulted from a major empirical analysis of training and performance outcome measures conducted by the United States Army ("Project A," Campbell, 1990) and has become somewhat of a gold standard in research and development projects in industrial and organizational psychology. The taxonomy posits eight broad, higher-order performance factors representing the range of outcomes that organizations value in their employees. The eight factors are intended to be distinct, and together, comprehensive. Although the system was developed and validated in an enlisted military context, it has been extended to apply to organizations more generally. The factors are sufficiently general that it seems reasonable to use the scheme as a way of organizing the factors important to graduate school success. Table 3 lists the factors, along with definitions and examples (Campbell et al., 1993).

Table 4 presents the categorization of the 21 attributes (from Table 2), along with seven competencies from Table 1 (Enright & Gitomer, 1989), into the eight higher-order performance factors from Table 3 (Campbell et al., 1993). As can be seen, the categorization appears fairly natural, that is, the Campbell scheme is a good basis on which to sort attributes. Every factor has a highly endorsed attribute (a top 7) associated with it, except for Factor V. Factor II, Non-Job-Specific Task Proficiency, has the most attributes. Factor VIII, Management/Administration may simply be a factor more important in organizations than in graduate schools. Note also that affective characteristics are sprinkled over most of the performance factors.

Measures of Factors Important for Graduate School Success

The discussion thus far has concerned what might be called the *latent factors* representing graduate school performance. A separate issue is how those abstract latent factors are actually measured. Table 5 lists many of the measures that have been used in previous validity research on higher education outcomes. What is striking in comparing Tables 4 and 5 is a mismatch between what faculty say are important outcomes, or graduate school success factors, and the convenience measures used in studies. Many of the convenience measures seem to be rather complex composites of the success factors. Grade point average might reflect many of the success factors—perhaps six of Campbell's eight factors. Comprehensive exams are probably fairly clean measures of Job-specific task proficiency (or more appropriately, Domain-specific proficiency), but ratings, commendations, research productivity, career indicators,

attrition, and time to degree are undoubtedly complex composites. It may be that unpacking these variables into constituents like the eight factors, or into the even more specific 36 attributes, or something in between, might prove to be a useful approach for several reasons. It might facilitate providing graduate faculty the information they say they want about students, suggest more targeted interventions to increase specific graduate school outcomes, and enable more precise and informative outcome information about the effects of those interventions.

Table 3

Campbell et al., Higher Order Performance Components

Factor	Definition	Examples (graduate student)
Job-specific task proficiency	Core tasks central to one's job	Knowledge of personality psychology methods and theories
Non-job-specific task proficiency	Required tasks that cut across many jobs	Teaching, literature reviewing, computer analyses
Written and oral communication task proficiency	Formal oral and written presentations, independent of content	Writing research reports, presenting a paper at a conference
Demonstration of effort	Spending extra effort when asked, working in adverse conditions	Working all weekend for a project due Monday, take on projects with tight deadlines
Maintenance of personal discipline	The degree to which negative behaviors are avoided	Avoiding alcohol and drug abuse, ethical infractions, excessive absenteeism
Facilitation of peer and team performance	The degree to which one helps peers	Help others with assignments, model goal directedness, involve others in group
Supervision/leadership	Supervisory tasks involving face to face interaction and influence	Head a project, model first-year graduate students, set goals, reward and punish
Management/ administration	Supervision without face to face interaction	Set goals for research group, establish timelines, monitor progress, recruit resources

Table 4

Mean Importance Judgments of Outcome Variables Organized by Campbell's Higher-Order Performance

Outcome variables	Mean rating
I. Job-specific task proficiency	
1. Research/scholarly experience (amount and quality)	1.52
5. Mastery of discipline	1.00
11. Ability to read and analyze research in the field	0.43
13. Breadth of perspective	0.29
C. Explanation (Enright & Gitomer)	
G. Synthesis (Enright & Gitomer)	
II. Non-job-specific task proficiency	
7. Ability to teach (cross-listed in VII and VIII)	0.62
8. Independence (cross-listed in IV)	0.43
9. Creativity; ability to think "out of the box"	0.43
14. Open mindedness	0.29
15. Opportunism/resourcefulness	0.29
16. Critical thinking ability, logic, problem solving ability	0.14
18. Computer literacy/understand and manage technology	0.14
19. Skill in investigation	0.14
20. Ability to find the facts: information gathering	0.14
B. Creativity (Enright & Gitomer)	
E. Planning (Enright & Gitomer)	
III. Written and oral communication task proficiency	
4. Communication (professional)	1.14
6. English-as-a-second-language ability	0.71
A. Communication (Enright & Gitomer)	
IV. Demonstration of effort	
2. Persistence/tenacity	1.48
8. Independence	0.43
10. Enthusiasm	0.43
17. Drive/commitment/motivation/zeal	0.14
D. Motivation (Enright & Gitomer)	

Outcome variables	Mean rating
V. Maintenance of personal discipline	
12. Values/character: integrity, fairness/openness/honesty, trustworthiness/consistency—personal and professional	0.29
21. Professional posture	0.14
VI. Facilitation of peer and team performance	
3. Collegiality/making professional connections/networking (cross-listed in VII)	1.38
F. Professionalism (Enright & Gitomer)	
VII. Supervision/leadership	
3. Collegiality/making professional connections/networking (cross-listed in VI.)	1.38
7. Ability to teach (cross-listed in II and VIII)	0.62
VIII. Management/administration	
7. Ability to teach (cross-listed in II and VII)	0.62

Note. Based on Campbell et al. (1993). Ratings, where given, are repeated from Table 2 (see note for Table 2).

Table 5

Indicators of Graduate School Success That Have Been Used in Research Studies

Indicator		Citation
Grade-point average	Overall	Kuncel, Hezlett, & Ones, 2001
	First year	Kuncel et al., 2001
	Specific courses	Goldberg & Alliger, 1992
Comprehensive exams		Kirnan & Geisinger, 1981
Faculty ratings	Student abilities	Kuncel et al., 2001; Sternberg & Williams, 1997
	Dissertation quality	
	Research	
	Internship performance	

Indicator		Citation
Peer ratings		Hirschberg & Itkin, 1978
Commendations		Nelson, 2000
Research productivity	Number of publications	Kuncel et al., 2001
	Citations	
Career indicators	Job offer	Cable & Murray, 1999; Clark & Centra, 1982; Crooks, Campbell, & Rock, 1979; Jamison, 1996
	Income & growth	
	Employment setting	
	Mobility	
	Job satisfaction	
Attrition		Kuncel et al., 2001
Time to degree		Kuncel et al., 2001

Predictors

Walpole et al. (2001) asked faculty to identify variables that ought to be considered in admissions, as predictors. Table 6 presents the results. Fit is the most important (2.24), but a number of noncognitive variables rated quite highly, including values and character (1.14), maturity and responsibility (1.00), and interpersonal skills (.86). All these were mentioned more often than research experience (.86) and problem solving ability (.43). As Walpole et al. (2001) put it, a number of these attributes "are not well represented in current admissions folders." According to the interviews, faculty attempt to glean some of this information from the personal statements applicants write, and from letters of recommendation. Table 7 lists the 30 attributes again, indicating which of these two sources faculty claimed to look to for this information.

This provides a starting point for thinking about the kinds of noncognitive variables faculty members believe are important for admissions. For this review, there are three categories of predictors: personality, attitude, and quasi-cognitive. There are also two background categories: environmental factors and group factors. For each predictor category, there is a review of factors for that group, one by one, discussing their definition, measurement, consequents (variables they predict), and antecedents (variables by which they are predicted). Also reviewed are several kinds of measurement for each factor. A practical discussion of the

prospects for use of these measures in admissions concludes. These are described in the template used for reviewing factors shown in Figure 2.

Table 6

Mean Importance Judgments of Admission Variables

Admission variables	Mean rating
Knowledge about program applying for, evidence of fit between student and program goals	2.24
Values/character: integrity, fairness/openness/honesty, trustworthiness/consistency—personal and professional	1.14
Maturity/responsibility/work habits/willingness to pay dues	1.00
Writing ability, intelligent writing	0.95
Research/scholarly experience (amount and quality)	0.86
Interpersonal skills (group/individual, work/social)	0.86
Commitment to field	0.71
Initiative/willingness to take a challenge	0.67
Breadth of perspective	0.43
Critical thinking ability, logic, problem solving ability	0.43
Drive/commitment/motivation/zeal	0.43
Ability to do advanced graduate work: masters? doctoral?	0.43
Leadership	0.43
Persistence/tenacity	0.29
Independence	0.29
Open mindedness	0.29
Communication (professional)	0.14
ESL ability	0.14
Creativity: ability to think "out of the box"	0.14
Computer literacy/understand and manage technology	0.14
Skill in investigation	0.14
Ability to find the facts: information gathering	0.14
Professional posture	0.14
Suited to environment in program applied for	0.14
Motivation to do research/scholarship	0.14

Admission variables	Mean rating
Flexibility	0.14
Positive attitude	0.14
Professional contribution (e.g., teacher involvement with school)	0.14
Ability to draw sound conclusions	0.14
Ability to plan ahead	0.14

Note. Rating is the mean mention level of the variable across the 21 participants, where 0 = not mentioned, 1 = conditional mention, 2 = moderate mention, and 3 = enthusiastic mention (from Walpole et al., 2001, Table 1). Higher ratings indicate greater endorsement.

Table 7

Methods for Obtaining Information on Admission Variables

Admission variables	PS	LR
Knowledge about program applying for; evidence of fit between student and program goals	●	
Values/character: integrity, fairness/openness/honesty, trustworthiness/ consistency—personal and professional	●	●
Maturity/responsibility/work habits/willingness to pay dues	●	●
Writing ability, intelligent writing	●	●
Research/scholarly experience (amount and quality)	●	●
Interpersonal skills (group/individual, work/social)		●
Commitment to field	●	
Initiative/willingness to take a challenge	●	●
Breadth of perspective		●
Critical thinking ability, logic, problem solving ability		●
Drive/commitment/motivation/zeal (determination)	●	●
Ability to do advanced graduate work: masters? doctoral?		●
Leadership		●
Persistence/tenacity	●	
Independence		●
Open mindedness		●
Communication (professional)		●
ESL ability		

Admission variables	PS	LR
Creativity: ability to think "out of the box"		
Computer literacy/understand and manage technology		
Skill in investigation		
Ability to find the facts: information gathering		
Professional posture		●
Suited to environment in program applied for		
Motivation to do research/scholarship		
Flexibility		
Positive attitude		
Professional contribution (e.g., teacher involvement with school)		
Ability to draw sound conclusions (logic)	●	
Ability to plan ahead		

Note. PS = personal statement, LR = letter of recommendation (from Walpole et al., 2001, Appendices A and B).

- Definition

- Measurement

    - Self-report—the typical survey or personality inventory

    - Performance tests—a highly desirable, but rare find in the affective literature

    - Ratings—by peers, faculty advisor, others

    - Known groups—studying a construct by studying those who possess it

- Factor as predictor

- Predictors of factor

    - Environmental factors

    - Group factors

- Prospects for applied use in admissions decisions

Figure 2. **Template for predictor variables.**

Personality Factors

In discussions of the role of noncognitive factors in graduate school, and their potential role in admissions, the factors that people usually have in mind are personality factors. Personality factors are those broad, stable personality traits (e.g., extraversion) assumed to operate consistently across a wide range of contexts. A theme in this review is that there are many other kinds of noncognitive factors. Still, because of their predominance in these kinds of discussions, it is appropriate to start with personality factors.

Many personality schemes and taxonomies have been proposed in psychology, such as Cattell, Eber, and Tatsuoka's (1970) 16-factor model (16 PF) and the Myers-Briggs typology, which is actually a four-factor model (Briggs & Myers, 1975). The plethora of schemes has made it difficult to appreciate the cumulativeness of personality research on a topic like predictors of graduate school success. Different investigators measure different factors with different instruments, making it difficult to perceive consistency in findings. Fortunately, a kind of consensus has emerged over the last decade that five basic factors underlie traditional personality assessment. These are extroversion, neuroticism (emotional stability), agreeableness, conscientiousness, and openness (Goldberg, 1992). The adoption of this scheme and the translation of older findings into a five-factor framework may lead to significant progress in our understanding of the relationship between personality and graduate school performance.

It is important to understand why, in a field as contentious as personality psychology, a consensus has emerged at all. We believe the reason is really twofold. First, the five-factor structure has been found across cultures and language groups (McCrae, Costa, Del Pilar, Rolland, & Parker, 1998). The five-factor structure is not unique to the United States, nor is it unique to the English language. Second, there is a compelling idea underlying the empirical discovery of five replicable factors. The idea is what Goldberg refers to as "the lexical hypothesis," which is that language evolves to produce words that encompass the most important or useful dimensions by which we characterize people. In the English language there are thousands of such descriptive personality adjectives. A reduction of those thousands of words, which can and has been accomplished with factor analyses of person ratings on all the personality-descriptive adjectives in a language, should yield the most basic, fundamental dimensions of personality. It is from studies done exactly this way that the five-factor model has emerged.

An important, but under-appreciated implication of this model is that other general personality dimensions, such as self-monitoring, alexithymia, machiavelianism, and locus of control are really for the most part reducible to, or represent weighted combinations of these five factors. In fact, considerable evidence has been amassed to demonstrate this (Goldberg, in press). In general, if the five-factor model is correct, any broad personality factor, identified through a self or peer assessment of trait adjectives, phrases, sentences, or paragraphs, or other depictions (e.g., video vignettes), should be accounted for by the Big 5.

Does that mean there is no role for personality constructs other than the Big 5? No, there are at least two kinds of variables that while fitting within the Big 5 scheme are not the Big 5 variables, and yet may be useful for both research and applied purposes. One kind is compound variables, that is, variables that represent particular combinations of the Big 5. Examples are those given in the previous paragraph. Snyder's (1987) Self-monitoring may be a combination of extroversion (+), agreeableness (+), and conscientiousness (-),[1] for example. Authoritarianism (Adorno, Frenkel-Brunswik, Levinson, & Sanford, 1950) might be a combination of conscientiousness (+), agreeableness (-), and openness (-) (these two examples from Funder, 2001). Psychoticism (Eysenck & Eysenck, 1968) might be a combination of conscientiousness (-) and agreeableness (-).[2] Similar compound variables, or "blends," such as Poise (extroversion [+] and neuroticism [-]), Provocativeness (extroversion [+] and agreeableness [-]), and Perfectionism (conscientiousness [+] and neuroticism [+]) are also featured in the Abridged Big-5 Circumplex Model (AB5C) (Hofstee, de Raad, & Goldberg, 1992). For particular purposes, and perhaps for understanding, the compound variables may in some circumstances be quite useful, even more so than the five factors themselves, although it is not at all clear that this represents a lack of comprehensiveness to the Big 5 scheme, as some have argued (Funder, 2001).

Another kind of variable that may usefully supplement the five factors are the sub-factors, or facets of the Big 5, such as excitement-seeking, friendliness, and assertiveness, which are facets of extroversion. These are not compounds or blends as much as they are shades of meaning (or technically, correlated dimensions within each) of the five factors. Again, in some situations, these facets may be more important (i.e., valid) than the five factors themselves (Paunonen & Ashton, 2001). It is important to note that unlike the Big 5, there is no standardization on the underlying facets: There are potentially hundreds if not thousands of them. The ones listed in Table 8 (which also presents items for each facet, one positive and one

negative) are listed because they happen to come from a popular Big 5 inventory, the NEO (Costa & McCrae, 1992). They represent a reasonable sense of the kinds of facets that can be found within the Big 5.

Table 8

Big 5 Factors, Facets, and Items

Big 5 Factor facet	Sample item from IPIP	
	Positive item	Negative item
Extraversion		
Friendliness	Make friends easily	Am hard to get to know
Gregariousness	Love large parties	Prefer to be alone
Assertiveness	Take charge	Wait for others to lead the way
Activity level	Am always busy	Like to take it easy
Excitement seeking	Love excitement	Would never go hang gliding
Cheerfulness	Radiate joy	Am not easily amused
Neuroticism		
Anxiety	Fear for the worst	Not easily bothered by things
Anger	Get angry easily	Rarely get irritated
Depression	Often feel blue	Rarely feel blue
Self-consciousness	Am easily intimidated	Am not embarrassed easily
Immoderation	Often eat too much	Rarely overindulge
Vulnerability	Panic easily	Remain calm under pressure
Conscientiousness		
Self-efficacy	Complete tasks smoothly	Misjudge situations
Orderliness	Like order	Forget to put things back
Dutifulness	Try to follow the rules	Break rules
Achievement striving	Go straight for the goal	Not highly motivated to succeed
Self-discipline	Get chores done right away	Waste my time
Cautiousness	Avoid mistakes	Jump into things without thinking

Big 5 Factor facet	Sample item from IPIP	
	Positive item	Negative item
Agreeableness		
Trust	Trust others	Distrust people
Facet	Positive item	Negative item
Morality	Wouldn't cheat on taxes	Use flattery to get ahead
Altruism	Make people feel welcome	Look down on others
Cooperation	Am easy to satisfy	Have a sharp tongue
Modesty	Dislike being center of attention	Believe I am better than others
Sympathy	Sympathize with homeless	Not interested in others' problems
Openness to experience		
Imagination	Have a vivid imagination	Seldom daydream
Artistic interests	Believe in importance of art	Do not like art
Emotionality	Experience emotions intensely	Seldom get emotional
Adventurousness	Prefer variety to routine	Stick to things I know
Intellect	Like to solve complex problems	Not interested in abstract ideas
Liberalism	Vote for liberal political candidates	Believe in one true religion

Note. From the International Personality Item Pool [IPIP] (n.d.). Items are administered with instructions to use a rating scale (1 = very inaccurate to 5 = very accurate) to "describe how accurately each statement describes you . . . as you generally see yourself now, in relation to other people you know of the same sex as you are and roughly the same age." Some items slightly abridged to fit in columns.

Other general personality factors have been proposed. Among these are optimism (Seligman, 1991), integrity (Ones, Viswesvaran, & Schmidt, 1993), and typical intellectual *engagement* (Goff & Ackerman, 1992). Their independence from the Big 5 has not been convincingly demonstrated (Goldberg, 1999), but because they have a literature surrounding

them, and for convenience, they will be included in the Big 5 categories of extroversion, conscientiousness, and openness, respectively.

There are also factors that legitimately appear to be outside the Big 5, primarily in the trait terms used to rate them, which might not appropriately be called personality descriptors. These include social-attitude factors like religiosity, conservatism, authoritarianism, and spiritualism (Saucier, 2000), and non-personality person-descriptive factors such as youthfulness, fashionableness, sensuality, frugality, humor, and luck (Saucier & Goldberg, 1998). Some of these appear to have some empirical relationship with the Big 5. Social-attitude factors are discussed further in the Attitudinal Factors section.

Definition of the Big 5 Factors. Five basic factors underlie traditional personality assessment: extroversion, neuroticism (emotional stability), agreeableness, conscientiousness, and openness (Goldberg, 1992).

Extraversion. Extraversion is the "people person" factor representing outgoingness and sociability, but also factors such as demonstrating independence, decisiveness, and orientation to negotiating. Facets include friendliness, gregariousness, assertiveness, activity level, excitement seeking, and cheerfulness. Hogan (1986) and Hough (1997) suggest that this factor can be divided into sociability or affiliativetiveness on the one hand (e.g., friendliness, gregariousness, cheerfulness), and ambition or potency on the other (e.g., assertiveness, activity level, excitement seeking). The factor of optimism is likely related to extraversion—it is a scale in the IPIP (Goldberg, 2001), and is related to the well-being scale in the California Psychological Inventory (CPI) (Gough, 1975). However, the construct has received lots of special attention due to a popular book by Seligman (1991).

Neuroticism (emotional stability). Neuroticism is the factor representing emotional stability vs. instability. An emotionally stable student would be one to respond well to stress and tight time deadlines, be adaptable, and take all information into account when making decisions, particularly under stress or deadlines (Goldberg, 2001). Facets include anxiety, anger, depression, self-consciousness, immoderation, and vulnerability. It may be useful to note that in Eysenck's personality theory formulated in the 1950s and 1960s, extraversion and neuroticism were the two primary factors.

Conscientiousness. Conscientiousness is a measure of the degree to which one is organized, follows schedules, performs administrative tasks accurately and thoroughly, follows

regulations and procedures, is disciplined, demonstrates integrity and adherence to ethical standards, is persistent and motivated, and exerts effort (Goldberg, 2001). Hough (1992, 1997) has suggested that his factor may be subdivided into two factors: dependability, that is, being careful, thorough, responsible, planned and organized, and achievement striving, that is, being perseverant and hard working.

Integrity. Integrity may be understood as a facet of conscientiousness, or as a compound variable consisting of conscientiousness, agreeableness, and adjustment(Ones & Viswesvaran, 1998). However, because of its important practical role in employment testing, it is often measured separately from conscientiousness, with its own assessments. Consequently, it has been treated separately from conscientiousness in metaanalytic studies of the validity of employment predictors (e.g., Ones, Viswesvaran, & Schmidt, 1993; Schmidt & Hunter, 1998). Integrity testing measures one's propensity towards counterproductive work behaviors, such as theft, drug and alcohol use, undependability, and causing property damage, through accidents or otherwise (Ones & Viswesvaran, 1998; Sackett & Wanek, 1996). Three of the most widely used integrity scales are the PDI Employment Inventory (Paajanen, 1985), the London House Employment Productivity Index (Rafilson, 1988); and the Reliability Scale of the Hogan Personnel Selection Series (Hogan & Hogan, 1989) (scales for the Big 5 are covered below).

Agreeableness. This factor has also been called likeability, friendliness, social conformity, and love. It is defined as being cooperative and considerate, treating others fairly, and with kindness, maintaining harmony, being tolerant, courteous, flexible, good-natured, and recognizing and rewarding others' performance. Facets include trust, morality, altruism, cooperation, modesty, and sympathy.

Openness-to-experience. This factor is also referred to as intellect and culture. It is considered the loosest or most varied factor, representing the degree to which one is open-minded, curious, creative, knowledgeable, analytic, and able to communicate effectively (Goldberg, 2001). Facets include imagination, artistic interests, emotionality, adventurousness, intellect, and liberalism. Hogan and Hogan (1995) differentiate the construct into intellectance (creativity) and school success (achievement orientation). Typical intellectual engagement (Goff & Ackerman, 1992), and need for cognition (Cacioppo, Petty, Feinstein, & Jarvis, 1996) are likely related factors.

Measurement. Several ways exist to measure the Big 5 Factors: self-reports, ratings, performance tests, and known groups.

Self-reports. Many multiple-scale personality inventories have been developed over the years. Although scales vary widely, all may measure at least some of the Big 5 Factors. Among the most widely used[3] are the California Psychological Inventory (CPI) (Gough, 1975), Comrey Personality Scales (CPS) (Comrey, 1970), Edwards Personal Preference Schedule (EPPS) (Edwards, 1959), Eysenck Personality Questionnaire (EPQ) (Eysenck & Eysenck, 1975), Gordon Personal Profile Inventory (GPPI) (Gordon, 1978), Guilford-Zimmerman Temperment Survey (GZTS) (Guilford, Zimmerman, & Guilford, 1976), Hogan Personality Inventory (HPI) (Hogan & Hogan, 1995), Jackson Personality Inventory (JPI) (Jackson, 1976), Minnesota Multiphasic Personality Inventory (MMPI) (Dahlstrom, Welsh, & Dahlstrom, 1972), Multidimensional Personality Questionnaire (MPQ) (Tellegen, 1982), Myers-Briggs Type Indicator (MBTI) (Briggs, Myers, & McCaulley, 1985), Omnibus Personality Inventory (OPI) (Heist & Yonge, 1968), Personality Research Form (PRF) (Jackson, 1976), and the Sixteen Personality Factor Questionnaire (16 PF) (Cattell et al., 1970).

Perhaps the most widely used Big 5 instrument per se is the revised NEO and its variants, (Costa & McCrae, 1992), such as the NEO-IP. Goldberg (1999) has put into the public domain an extensive set of personality items measuring the Big 5 factors and their facets (IPIP, n.d.). He calls the project the International Pool of Personality Items (IPIP). This is an amazingly useful resource, likely to have a significant impact on research progress, as researchers are now free to assemble five-factor inventories for just about any purpose, free of charge.

Ratings. Inventories such as the NEO and the IPIP are typically administered as self-ratings, but peer (and supervisor and teacher, etc.) ratings are equally possible, and in fact have been employed since the earliest formulations of the five-factor model (Norman, 1963; Tupes & Christal, 1958). The Big 5 factor structure is similar regardless of whether it is based on peer or self ratings, but there can be discrepancies between peer and self ratings (Lanthier, 2000). Discrepancies, although minimized with familiarity with the subject (Paunonen, 1989), may in themselves be informative. Mount, Barrick, and Strauss (1994) showed that others' ratings added to self-ratings in incrementing the validity of personality constructs for job performance.

Performance tests. There have been attempts to develop performance tests (also called objective-analytic, or ability tests) for measuring general personality factors over the years (e.g.,

Cattell & Schuerger, 1978), but they have not met with tremendous success. A number of studies (e.g., Kinney, 1999) have tried variants on reaction time methods, such as latency to endorse a trait adjective as self-descriptive, on the assumption that short latencies indicate more intensity (positive or negative endorsement) with respect to that trait term. Another method has been word recognition time, under the assumption that more personally salient terms are recognized more quickly. However, reaction times reflect other processes, such as mental speed, and one's familiarity with the term, which confounds the interpretation.

A potentially more promising approach to a performance personality test is the conditional reasoning paradigm developed by James (1998). This involves presenting a reading passage with a multiple-choice problem that looks like a typical reasoning problem one might find on something like the GRE General Test (reading comprehension). However, the problem presents two equally correct answers (of five alternatives). The idea is that one's choice from among the two correct answers reflects justification mechanisms one habitually employs, which reflect something about one's personality. For example, James suggests that achievement motivation can be reflected by two quite different dispositional tendencies—the motive to achieve, and the fear of failure—and that individuals habitually favor one over the other. A conditional reasoning problem can be written to determine which tendency a particular individual favors.

As an example James (1998) provides a passage that describes the relationship between stress, heart disease, and Type-A personality. It then asks the question, "Which of the following would most weaken the prediction that striving for success increases the likelihood of a heart attack?" Three of the alternatives are wrong on logical grounds, but two, according to James, are equally valid. One is that "A number of nonambitious people have heart attacks." The other is that "Recent research has shown that it is aggressiveness and impatience, rather than achievement motivation and job involvement, that are the primary causes of high stress and heart attacks." According to James, those motivated by fear of failure choose the former, because they agree with the passage's conclusion (that success striving increases heart attack risk), and they opt for the wounding response alternative (something that does not seriously invalidate the conclusion). On the other hand, achievement motivated individuals choose the latter, because it is based on a more positive connotation of achievement striving.

James (1998) presents an additional example to measure aggressiveness, and suggests that his general method could be used to develop items for other personality constructs. He also presents some empirical evidence supporting the validity of his approach. However, the approach and the items yielded by it are obviously in their infancy, and only further research will demonstrate whether this is a viable method for measuring personality.

Known groups. The known groups method involves identifying a group acknowledged to be high (or low) on a particular construct (e.g., creativity), and then measuring various attributes of the known group as a way to study the construct (e.g., creative people are verbally fluent). This method has only indirectly been employed in studying personality, through empirical response keying accompanied by psychiatric diagnosis, as in the MMPI (Dahlstrom et al., 1972).

However, a perhaps somewhat related method is the open-ended personal narrative (McAdams, 1999). This method involves participants describing significant events in their lives, such as life-story high points, low points, turning points, and earliest memories (McAdams, Reynolds, Lewis, Patman, & Bowen, 2001), and coders interpreting those narratives for personality imagery. The coding is critical. McAdams et al. found that the specific coding of narratives for redemption and contamination imagery was more predictive of well-being than was an overall affective assessment of the narrative. Like James' (1998) conditional reasoning, McAdams' personal narrative approach is a relatively novel methodology, and it is not clear how or whether it might be translatable to other personality constructs. It is worth noting that candidates routinely submit personal narratives of sorts to graduate admissions committees in the form of personal statements. Perhaps developments in methodology for scoring personal narratives could inform our analysis of personal statements.

Big 5 Factors as predictors. There are few large-scales studies on the relationship between personality and success in higher education. However there have been several meta-analyses of the relationship between personality and job training and job performance. Conscientiousness is probably the most consistently strong predictor of job performance, regardless of the job, followed by emotional stability, then extraversion (Barrick & Mount, 1991; Barrick, Mount, & Judge, 2001; Hurtz & Donovan, 2000; Salgado, 1998; Tett, Jackson, & Rothstein, 1991), and sometimes agreeableness, particularly for jobs involving teamwork (Mount, Barrick, & Stewart, 1998). Because personality is independent of cognitive ability (with the exception of a modest correlation between cognitive ability and openness), personality

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validities for job performance, particularly conscientiousness and integrity, are incremental (Schmidt & Hunter, 1998). The magnitude of incremental validity is significant—approximately in the .10s and .20s. Several have suggested that differentiating outcome criteria yields even stronger relationships (Hurtz & Donovan, 2000). For example, Hogan and Holland (2002) suggest that dividing job criteria into the categories of getting along (e.g., helping others) and getting ahead (e.g., coming to work early and leaving late), result in higher validity coefficients than are obtained when lumping all criteria together, and the magnitude runs from the .30s to .40s (for all factors). These are clearly substantial validities considering that they are uncorrelated with cognitive ability.

There have been several small studies relating personality variables to educational variables. They mostly confirm the general findings from the industrial-organizational literature, that conscientiousness is important (e.g., Busato, Prins, Elshout, & Hamaker, 2000; Hirschberg & Itkin, 1978; Van-Heyningen, 1997), and that the other personality variables can be important depending on the criterion (e.g., Chemers, Hu, & Garcia, 2001; Musgrave-Marquart, Bromley, & Dalley, 1997; Brown & Marshall, 2001). However, there have been no meta-analyses of this literature (and at this point there does not seem to be enough data on which to conduct a meta-analysis).

It may seem puzzling why so few validity studies of personality on higher education outcomes have been conducted, given the demonstration of the importance of personality in work settings. Goldberg (2001) and Reeve and Hakel (2001) provide specific suggestions for how personality variables (e.g., factors, facets, and items) reflect specific valued graduate school outcomes. Both suggest that conscientiousness and emotional stability ought to predict graduate school outcomes across the board, with extraversion, and perhaps agreeableness predicting success in particular academic disciplines (they do not say so, but one can speculate that teaching, nursing, and clinical disciplines might show such relationships). Of course, openness is likely to be related to academic outcomes, too, but it is the one personality factor consistently correlated with general cognitive ability—it typically fails to show incremental validity over general cognitive ability in studies where both factors are included.

Goldberg (2001) suggests that the reason for the shortage of validity studies is that university selection is higher stakes than employment selection, which would lead to higher scrutiny, and that educators fear that "self-reports are far too amenable to impression

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management to be used in high-stakes contexts" (p. 11). He counters by pointing out literature suggesting that the importance of impression management is overblown (Ellingson, Smith, & Sackett, 2001; Smith, Hanges, & Dickson, 2001), a point we return to in the Prospects for Applied Use in Admissions Decisions section.

Predictors of the Big 5 Factors. Among the predictors of the Big 5 are environmental factors and group factors.

Environmental factors. For the purpose of this review, we treat personality as an independent variable, unaffected by environmental factors (see Figure 1). This is in keeping with the current consensus of opinion, which suggests that the broad personality factors discussed in this section are relatively stable over time (e.g., Heath, Neale, Kessler, Eaves, & Kendler, 1992). This is not to say that specific environmental factors (e.g., repeated and prolonged exposure to stressful events) cannot affect personality (e.g., neuroticism)—this is a complex topic about which surprisingly little is yet known (Brody & Crowley, 1995). It is just that intervention studies on personality factors have not been conducted, and so we know almost nothing about changes in personality. In this review, we differentiate the broad and stable factors covered in this section from more specific factors, which are likely more malleable. These more specific factors are discussed in the Motivation Factors section later in this paper.

Group factors. The same basic five-factor structure is found across different language groups. The following are some examples: Greek (Tsaousis, 1999), Spanish (Benet-Martinez & John, 1998), German, and Dutch (De Raad & Hendriks, 1997); ethnic groups (e.g., White, Black, Indian, and mixed-race South African college students) (Heuchert, Parker, Stumpf, & Myburgh, 2000); and groups within the United States (e.g., Black and White students) (Collins & Gleaves, 1998). This discredits the idea that the big-five taxonomy is a perspective on personality unique to western culture, to the United States, or to the majority racial/ethnic group within the United States. A Big 5 measure is available in numerous languages, including, in addition to those mentioned above, Brazilian, Chinese, Croatian, Hebrew, Hungarian, Italian, Japanese, Polish, Slovak, and Swedish (Hendriks, Hofstee, & de Raad, 1999).

There seems to be little if any difference in means between gender or racial groups on personality factors or facets (Collins & Gleaves, 1998; Goldberg, Sweeney, Merenda, & Hughes, 1998). Heuchert et al. (2000) found a small mean difference between White, Indian, and Black

students from South Africa in openness, particularly the openness to feelings facet, which they attributed to cultural differences.

Prospects for applied use in admissions decisions. In this section we consider practical issues associated with using personality measures in admissions decisions. There are numerous ways personality measures could be used: We can classify them into guidance uses, and selection uses.

A major issue in using personality in selection is that personality is primarily measured through self-reports. Consequently, there is a question about the degree to which personality tests are susceptible to faking. Reeve and Hakel (2001) suggested three approaches to detecting and controlling faking. Detection and correction involves mixing lie scale (or social desirability scale) items in with other personality items. Such items are highly sensitive to instructions to fake good, and respondents who are shown to score highly on such items can have their responses to the other personality items statistically adjusted. The problem with this method is that even with adjustment, it is almost always advantageous to fake good (Ellingson, Sackett, & Hough, 1999), and more generally, with open disclosure, it would likely be possible for coaching schools to figure out a way to beat the scoring adjustment system.

A second procedure is the warning method, in which the proctor warns examinees that their score patterns will be scrutinized and adjusted if found to be dishonest. Although this method has proven successful in research, it is unlikely that the warnings would have any effect in a large-scale, high-stakes setting, particularly for some individuals. Some test takers go to extraordinary lengths to cheat on the test, even risking arrest (e.g., Carnevale, 2002).

A third method is the subtle-items method, involving the use of items that bear no obvious relationship to the factor being measured, such as the kind of empirically keyed items used on the MMPI (e.g., "Do you like red cars?"). The problems are that such items are typically less valid, and, perhaps more importantly, may be vulnerable to legal challenges questioning the connection between responses on such items and performance in graduate school. An important, possible exception to these limits are the kinds of conditional reasoning items developed by James (1998). Although subtle, such items do connect to the factor being measured through a rational, if complex, chain of reasoning, which presumably would fare well in a court challenge. Whether such items are as valid as more typical personality items remains to be seen. And

whether the hundreds or even thousands of items necessary for a high-stakes test could be developed also remains to be seen.

A fourth method is the multidimensional forced-choice method, involving the pitting of two or more presumably equally attractive, but quite distinct trait statements, to which the examinee must indicate a preference. This is an ipsative approach to personality measurement, and cannot be assumed to produce scores similar to the normative scores on which most of the known research in personality is based. Thus this must be considered only a potentially promising method.

If somehow the intentional response distortion effect could be controlled, there would remain the problem of generating items for new test forms. There are many ways to express personality items, limited only by an item writer's creativity in devising situations and expressing those in an accessible vocabulary. However, it is not clear that the realm of items and situations would be large enough to disguise the underlying construct being asked for. There may be millions of ways to ask whether an applicant is dependable and hard working. Still, once an applicant knew that conscientiousness is what he or she was being tested for, might not any question that tapped it be obvious?

Using personality for guidance—to help a candidate make a good decision about whether and what kind of graduate school program to attend—avoids all the problems associated with using personality for selection. Coachability, fakability, and item security are simply not issues, because the candidate has no reason to fake responses.

Another way to possibly avoid the problems of selection is through the use of others' rating of personality. Others could be advisors, professors, and other members of the college community who typically write letters of recommendation for students now. Although they too could be taught to game the system and fake good for their applicant ratee, it would seem that that problem is no greater or less than the current problem of distortion in letters of recommendation. One problem that might be greater with such a scheme than it is with current letters of recommendation is one of increased scrutiny, and perhaps legal exposure. Current letters typically use circumspect language, which a personality form filled out by a faculty advisor would explicitly avoid.

In any event, there is a lure in using personality as part of the admissions process. As Sackett, Schmitt, Ellingson, and Kabin (2001) and Goldberg (2001) point out, the laudable goals

of both increasing ethnic diversity and assessing the full range of relevant attributes are pursued by adding something like a Big 5 personality assessment to the mix of selection materials. Until a way around the major problem of intentional response distortion can be discovered, perhaps through ability-test or performance-test methods such as those James (1998) has developed, it is unlikely that personality can be measured through self reports. However, other reports, provided by the same supervisors and mentors currently providing letters of recommendation, might present an attractive alternative for systematically introducing personality information into the admissions process.

Quasi-Cognitive Factors

Although this review concerns noncognitive factors, the scope is broadened somewhat to include four quasi-cognitive factors—creativity, emotional intelligence, cognitive styles, and metacognition. There are two reasons for this. First, these factors, at least the first two, are often brought up in discussions of important factors not measured by tests like the GRE General Test. Second, each may indeed include a significant affective or noncognitive component.

Creativity. Creativity is a difficult factor to define and operationalize, in part because researchers disagree on what it is (e.g., Torrance, 1988). Some have focused on creative people and defined creativity as the abilities found in such people (e.g., Guilford, 1950). Others have focused on creative products, believing that studying them will produce insights into the nature of creativity (e.g., Bruner, 1962; Jackson & Messick, 1965). One definition of whether a product is creative is whether "appropriate observers independently agree it is creative" (Amabile, 1996, p. 33).

Others see creativity as a conflux of different variables that must be present for a creative act to occur. These variables can include the correct environment, sufficient intelligence and motivation, and thinking and personality styles that are conducive to creative behavior (e.g., Amabile, 1996; Csikszentmihalyi, 1996; Sternberg & Lubart, 1996).

Measurement of creativity. There are several ways to measure creativity: self-reports, biographical data, performance tests, ratings/product ratings, known groups, and observation.

Self-reports. A way to find out if someone is creative is to have the person estimate his or her own creativity (e.g., Furnham, 1999b). Indeed, many major personality assessments (e.g., the California Psychological Inventory; Myers-Briggs Type Indicator) include creativity indexes. Other methods include providing brief characterizations of creative individuals that examinees

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are then asked to identify as being similar or dissimilar to themselves (the Self-Descriptive Creativity Test, Smith, & Faeldt, 1997), and examining beliefs about and strategies used for creativity (The Creativity Styles Questionnaire, Kumar & Holman, 1989).

Biographical data. Accomplishments such as awards (Kaufman, 2000-2001), length of career (Crozier, 1999), age at different accomplishments (Simonton, 1988), influence, productivity, and international recognition (Ludwig, 1995) have been examined in studies of eminent creative individuals. Biographical data has also been used to study everyday creativity for example, through lists of creative accomplishments (King, McKee-Walker, & Broyles, 1996), or questions about past creative performance (Hocevar, 1979; Taylor & Ellison, 1966).

Performance tests. The popular Torrance (1974) Tests of Creative Thinking (TTCT) include both verbal items, for example, showing participants a picture or a product and asking a series of questions about it; and figural items, for example, presenting an idea (the caterpillar with too many legs) and then asking participants to draw a figure based on the idea. The test is scored using a rubric that rewards unusual responses. Many of Guilford's (1967) divergent thinking measures are similar, allowing respondents to generate elaborations of a given shape, or hypotheses about different outcomes of an event (e.g., if people didn't need sleep). Similar tests have been designed by others (Getzels & Jackson, 1962; Wallach & Kogan, 1965). Finke, Ward, and Smith (1992) developed a slightly different approach. They asked participants to create inventions or devices that are then judged by experts for creativity or other attributes.

Ratings/product ratings. Studies have used creativity ratings of products by teachers (Besemer & O'Quin, 1986) or parents (Runco & Vega, 1990). Amabile (1996) developed a Consensual Assessment Technique (CAT), in which raters, solicited for their experience in a domain, provide independent judgments about the creativity of a product. Raters compare products against each other, rather than against an absolute ideal, and the products are judged in a random order (Amabile, 1985; Amabile, Hennessey, & Grossman, 1986; Conti, Coon, & Amabile, 1996). One concern of this method is that raters from different cultures can differ on their perceptions of creativity (Niu & Sternberg, 2001).

Known groups. Another method of examining creativity is to identify a group of people who are known to be creative and study their common traits or features. Some researchers have examined a wide sample of known groups of eminent individuals from a variety of professions (e.g. Ludwig, 1995; see Simonton, 1994). Others have identified subgroups thought to be

particularly creative, such as actors (Hammond & Edelmann, 1991), architects (Hall & MacKinnon, 1969), cinematographers (Domino, 1974), advertising directors (Broyles, 1996), musicians (Wills, 1984), and creative writers (Kaufman, 2001a).

Observation. Observation is rarely used in the measurement of creativity, in part because successful creative people will rarely allow themselves to be observed while working and in part because it is difficult to learn very much from watching someone during a creative activity. An exception was a study by Dunbar (1995), who spent a year observing scientists work in laboratories. Through interviews, observations, video and audiotaping, he found that creative scientists did not often experience sudden insight, but rather proceeded along a very careful and well-reasoned mode of study.

Predictors of creativity. In his structure of cognitive abilities, Carroll (1993) assigns creativity to his second-stratum factor called broad retrieval abilities, which also encompasses fluency measures (e.g., write all the five-letter words that begin with "s" and end in "g" in two minutes). The focus here is on creativity's links to other noncognitive factors.

Personality factors. Openness to experience correlates with creativity. This has been found with self-reports of creative acts (Griffin & McDermott, 1998), biographical data on creative accomplishments (King, McKee-Walker, & Broyles, 1996), creative professions (Domino, 1974), analyzing participants' daydreams (Zhiyan & Singer, 1996), creativity ratings on stories (Wolfradt & Pretz, 2001), and psychometric tests (Furnham, 1999a; McCrae, 1987).

Artistic creativity has been found to be negatively associated with conscientiousness when studying creative professions (Dudek, Berneche, Berube, & Royer, 1991) and using biographical data (Walker, Koestner, & Hum, 1995); however, no such relationship exists for scientific creativity. If anything, the tendency is in the opposite direction (see Feist, 1999). There may be a possible interaction between openness to experience and conscientiousness; among people who are high in openness to experience, conscientiousness may reduce creativity as scored in a test of fluency (Ross, 1999).

There may also be a mild link between creativity and extraversion. Martindale and Dailey (1996) had participants write a fantasy story, which was then rated for creativity, and also administered psychometric tests; they found a significant, positive relationship with extraversion. This relationship was also found in an analysis of biographical data, controlling for academic accomplishments (King et al., 1996) and using psychometric tests (Richardson, 1985; Srinivasan,

1984). Yet Roy (1996), in a study of fine artists (in comparison to other professions), found that the artists were more introverted than the controls; Mohan and Tiwana (1987) found similar results with a group of creative writers. Several other studies (most notably Matthews, 1986; McCrae, 1987) found no significant relationship at all.

   Motivation factors. Some attention has been given to the relationship between motivation and creativity, particularly the distinction between intrinsic and extrinsic motivation. A common claim is that intrinsic motivation (performing an activity for enjoyment) is more conducive to creative work than extrinsic motivation (performing an activity for a reward). This seems to be true whether motivation is natural (task involvement; Ruscio, Whitney, & Amabile, 1998) or induced experimentally, for example by reading about extrinsic reasons for writing (Amabile, 1985). Some have argued that the case against extrinsic motivation is overstated (Eisenberger & Cameron, 1996). Rewards can improve performance if the criterion task requires divergent thinking (Eisenberger & Selbst, 1994), the instructions emphasize the need for creativity (Eisenberger, Armeli, & Pretz, 1998), or students are experienced with creative acts (Eisenberger, Haskins, & Gambleton, 1999). These studies measured creativity through product ratings.

   Environmental factors. Social support may be important to creative work (Bargar & Duncan, 1990). Having supportive teachers (Cole, Sugioka, &Yamagata-Lynch, 1999) or friends as collaborative partners (Miell & MacDonald, 2000) has been shown to lead to products judged more creative.

   Group factors. Women and men score similarly on creativity tests regardless of culture and background (see Barron & Harrington, 1981**;** Saeki, Fan, & Van Dusen, 2001; Wang, Zhang, Lin, & Xu, 1998). For Black and White students, there have been no significant differences in creative performance on the TTCT (Glover (1976a, 1976b), ability to be trained on creative abilities (Moreno & Hogan, 1976), and in biographical measures of aesthetic expression (Stricker, Rock, & Bennett, 2001).

   Results are less clear for other cultures. American college students scored higher on the TTCT than Japanese college students (Saeki et. al., 2001). Malaysian students scored higher than American, Indian, and Hungarian students on one self-report measure of creativity, but American students scored higher than Malaysian students on a different self-report measure (Palaniappan,

1996). One problem with assessing creativity in other cultures is that the definition of creativity may be culture-specific (see Lubart, 1999).

Criterion factors. While creativity (as measured by psychometric tests such as the TTCT) is significantly correlated with intelligence, particularly verbal intelligence (e.g., Barron & Harrington, 1981), the correlation is not especially strong. In addition, correlation with intelligence is only true up to a point (usually found to be approximately an IQ of 120; Getzels & Jackson, 1962). Similarly, creativity as measured by the TTCT accounted for some variance in academic performance, but less so than other cognitive variables (e.g., Niaz, Saud de Nunez, & Ruiz de Pineda, 2000).

Creativity scores have been shown to predict persisting in difficult situations (Falat, 2000), more effective coping strategies (Carson, Bittner, Cameron, & Brown, 1994), and better leadership abilities (Simonton, 1984). However, creativity is usually considered an end goal in itself, and the effect of creativity on other desirable outcomes is not often researched.

Emotional intelligence. "Is 'emotional intelligence' a contradiction in terms?" With that question, Salovey and Mayer (1990) started a renewed interest in emotional intelligence (EI) as a research topic. The idea that emotion is a significant part of our intellectual being has roots in the works of Darwin (1872/1965) and Freud (1923/1962), and, more recently, in the work of Cantor and Kihlstrom (1985), Gardner (1983), and Sternberg (1985). Cantor and Kihlstrom's (1985) reconception of social intelligence places the ability to solve problems in social situations as a core construct of personality. In Gardner's (1983) theory of multiple intelligences, two of his proposed seven intelligences involve emotions: Interpersonal intelligence (understanding other people) and intrapersonal intelligence (understanding one's self). Sternberg's theory of successful intelligence (also known as practical intelligence) is another major theory of intellect that takes into consideration the importance of emotional well-being (Sternberg, 1985, 1996; Sternberg & Kaufman, 1998). The common historical view, however, has been that emotions are secondary—indeed, inferior to—intellect (Salovey, Bedell, Detweiler, & Mayer, 1999).

Salovey and Mayer's (1990) initial model of emotional intelligence had three factors: appraisal and expression of emotion, regulation of emotion, and utilization of emotion. Appraisal and expression of emotion is comprised of emotion in the self (which can be both verbal and nonverbal) and emotion in others. Emotion in others consists of nonverbal perception of emotion and empathy. The second factor, regulation of emotion, is the ability to regulate emotion in the

self, and the ability to regulate and alter emotions in other people. The final factor, utilizing emotional intelligence, has four aspects: flexible planning, creative thinking, redirected attention, and motivation. Flexible planning refers to the ability to produce a large number of different plans for the future, enabling the planner to better respond to opportunities. This production of many plans can result from utilization of emotion and mood changes to one's advantage and looking at a wide variety of possibilities. Creative thinking, the second aspect, may be more likely to occur if a person is happy and in a good mood. Redirected attention involves the idea that when strong emotions are experienced, a person's resources and attentions may be turned to new problems. A person who can use this phenomenon to his or her benefit will be able to use a potentially stressful situation to focus on the most important or pressing issues involved. Motivating emotions, the final principle of emotional intelligence, refers to the art of making one's self continue to perform difficult tasks by focusing one's anxiety or tension toward the performance of that task.

This initial model of emotional intelligence has been revised (Mayer & Salovey, 1997; Mayer, Salovey, & Caruso, 2000). They now propose four abilities: perceiving, appraising, and expressing emotions; accessing and producing feelings in aid of cognition; comprehending information on affect and using emotional knowledge; and regulating emotions for growth and contentment.

Since the initial conceptualization of emotional intelligence, there have been some alternate definitions presented. Goleman (1995), who popularized the term in his best seller, has a broader view of EI that includes motivation, self-control, and persistence. Bar-On (1997) expanded the concept of EI even further, tapping "an array of noncognitive capabilities, competencies, and skills" (p. 14) that include assertiveness, independence, empathy, problem solving, happiness, and optimism.

Measurement of emotional intelligence. There are several different methods to measure emotional intelligence. These include self-reports, performance tests, ratings, and known groups.

Self-reports. The Bar-On Emotional Quotient Inventory (EQ-i, 1997) is a self-report inventory that has five composite factors: intrapersonal composite (emotional self-awareness, assertiveness, self-regard, self-actualization, and independence), interpersonal composite (empathy, interpersonal relationship, and social responsibility), adaptability composite (problem solving, reality testing, and flexibility), stress management composite (stress tolerance and

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impulse control), and general mood composite (happiness and optimism). Scores on the EQ-i were found to be significantly correlated with self-reported and observer scores on emotional intelligence.

Other self-report measures include the Trait Meta-Mood Scale (Salovey, Mayer, Goldman, Turvey, & Palfai, 1995), a predecessor of the MEIS (see below), Emotional Control Questionnaire (Roger & Najarian, 1989), Questionnaire Measure of Emotional Empathy (Mehrabian & Epstein, 1970), and the EQ test (Goleman, 1995). One criticism of many of the self-report tests of EI is that they overlap too much with personality tests to provide any new information of note (Davies, Stankov, & Roberts, 1998). The EQ-i has been criticized for overlapping too much with optimism (J. D. Mayer, personal communication, June 2002) and such specific personality tests as the California Personality Inventory (Matthews, Zeidner, & Roberts, 2003). In addition, self-report tests have also been criticized for representing a person's perception of their EI instead of a person's actual EI (Matthews et al., 2003)—and, indeed, people with low EI might not have the insight to recognize this fact and end up rating themselves quite high.

Performance tests. The most recent and most researched performance test of EI is the Multifactor Emotional Intelligence Scale (MEIS) (Mayer, Caruso, & Salovey, 1999). The MEIS consists of 4 branches of EI that have three measures each: perceiving, facilitating, understanding, and managing emotion. These tests consist of such items as measures of emotional perception, measuring judgments of synesthesia (such as "How hot is anger?"), understanding of emotion (such as "Optimism most closely combines two emotions," with choices including the correct answer, "pleasure and anticipation"), and scenario tasks involving emotional management (Mayer et al., 2000). The MEIS found that EI was correlated with both measures of verbal intelligence and self-reported empathy, and that the different measures were intercorrelated. A recent large investigation of the MEIS (Roberts, Zeidner, & Matthews, 2001) found evidence for convergent and divergent validity but poor reliability. In addition, the two scoring processes (expert scoring, in which scores are compared to the response of an expert in emotions, and consensus scoring, in which scores are compared to the average response) produced different—and often contradictory—results.

A very recent revision of the MEIS that has not been extensively researched yet is the Mayer-Salovey-Caruso Emotional Intelligence Scales (MSCEIT) (Mayer, Salovey, &, Caruso, 2001).

Other performance tests include the Emotion Perception Tests (Mayer, DiPaulo, & Salovey, 1990), which measures emotion perception in faces, color, music, and sound intervals, and the Emotional Accuracy Research Scale (Mayer & Geher, 1996), which consists of emotional vignettes and then items that ask the test taker what moods the characters in the vignettes are experiencing. The Emotion Perception Tests and other performance tests have been criticized for low reliability (Davies et al., 1998); the MEIS was produced after this study was conducted.

The choice to use a self-report versus a performance assessment may reflect the conception of EI; a self-report test is similar in format and requirements to personality inventories, while performance measures are more comparable to mental ability measures such as intelligence tests (Matthews et al., 2003). One problem with the EARS is that there are two types of scores: consensus-agreement, in which the test taker selects the emotion most often selected for each vignette; and target-agreement, in which the test taker selects the emotion that the real character from the vignette selected. These two scores are not significantly correlated (Geher, Warner, & Brown, 2001), which may raise questions about the validity of the instrument.

Ratings. Expert ratings have been used in the assessment of emotional perception, which is related to EI. Written or videotaped interactions between individuals can be shown to participants, who then respond by identifying the emotions the individuals are experiencing (Mayer et al., 2000). These responses are compared to expert responses and then scored by (e.g., Ekman, 1999).

Known groups. Using known groups is not as applicable to the study of emotional intelligence because it is not as clear which groups are known for high EI, as there is no clear criteria for selection (unlike creativity, where it would be reasonable to call painters or poets a known group). The only way to divide people into high and low emotional intelligence would be to measure their EI (such as through a performance test).

Emotional intelligence as predictor. Several proponents of EI have argued that it is a central determinant of leadership (Caruso, Mayer, & Salovey, 2002; George, 2000; Goleman, 1995). Several studies have shown a positive relationship between leadership and emotional intelligence. For example, higher emotional intelligence in managers as measured by the EQ-i was related to increased business success (Derman, 1999). EI accounted for variance in leadership

experiences (Kobe, Reiter-Palmon, & Rickers, 2001). And people who were high in EI as measured by psychometric tests were more likely to be perceived as leaders (Massey, 1999).

The nature of the relationship between academic and intellectual abilities and EI is not yet perfectly established. Some studies have used the MEIS and found no relationship with IQ (Ciarrochi, Chan & Caputi, 2000); others have found relationships between scores on the MEIS and intellectual performance (Lam, 1999; Mayer et al., 1999). A study of academically successful and unsuccessful South African students found that successful students had a significantly higher EQ as measured by the EQ-i than the unsuccessful students (Bar-on, 1997). However, it is worth noting that only three of composites used in the EQ-i were significantly higher (adaptability, general mood, and stress management).

Predictors of emotional intelligence. Several factors can be predictors of emotional intelligence. These include environmental factors, general personality factors, and group factors.

Environmental factors. Family support and parental influence have been found to have a significant positive effect on EI as measured by a psychometric test (Martinez-Pons, 1998), while a study of breast cancer patients linked social support to EI as measured by a test of emotional disclosure and a by a cognitive processing task of emotions similar to those found on the MEIS (Cunningham, 2000). There has been theoretical speculation (e.g., Ross, 2000) that an improvement in the social and emotional climates of the schools would lead to higher student emotional intelligence. A different theory, however, argues that female students who are academically successful, yet from disadvantaged backgrounds, developed higher levels of emotional intelligence (LePage-Lees, 1997).

General personality factors. Emotional intelligence has been strongly found to relate to personality dimensions, particularly emotional stability and agreeableness. Studies that administer self-report measures of emotional intelligence and personality inventories (e.g., Davies et al., 1998; Murensky, 2000) have found so much overlap with EI and personality dimensions as to argue that EI as measured by self-report inventories does not have sufficient divergent validity to distinguish itself from personality measures (see Matthews et al., 2003, for a fuller discussion of the relationship between personality and emotional intelligence).

Group factors. Goleman (1995) theorized that women would score higher on EI, but early results do not bear this out. Some studies using the EQ-i have found no differences (e.g., Bar-On, 2000), while others using multiple measures (including the MEIS) found conflicting

results (e.g., Roberts et al., 2001). The conflicting results showed women scoring higher on the MEIS when consensual scoring was used, and men scoring higher when expert scoring was used. There is even less research on issues of race and ethnicity, with Matthews et al. (2003) calling the available work "scant and contradictory." Bar-On (2000) reported no differences on the EQ-i. Roberts et al. (2001) found no differences with consensual scoring of the MEIS, but found that expert scores favored Whites.

Cognitive styles. Cognitive styles (also thinking styles) are consistencies in how people interpret and respond to information or problems presented to them. They are not abilities, but rather, characteristic strategies, preferences, and attitudes concerning how to use abilities (Messick, 1989; Sternberg, 1997).

The most well known cognitive style is field dependence-independence (see Witkin & Goodenough, 1981 for an overview). Those who rely on the context of a situation, or external cues, are called field dependent (or relational); those who rely more on internal cues and focus on specific details are called field independent (or analytical) (Anderson & Adams, 1992). A criticism of this view is that field independence overlaps with fluid intelligence, and is therefore ability rather than a style (Grigorenko & Sternberg, 1995).

Other cognitive styles include Bruner's (1986) distinction between paradigmatic and narrative thinking. Paradigmatic thought is logical and scientific (what is), while narrative thinking is more concerned with seeing connections and telling a story (what might be). Sternberg's (1988, 1997) model of thinking styles, called Mental Self Government, proposes three styles: Legislative, Executive, and Judicial. Legislative thinkers prefer to create things and to be self-directed. Executive thinkers prefer to follow directions and to work under a great deal of structure. Judicial thinkers like to judge and evaluate things.

Measurement of cognitive styles. Among the different ways to measure cognitive styles are self-reports, performance tests, and product ratings.

Self-reports. There are several self-report measures of cognitive styles; one recent one that has been used in several research studies is the Mental Self-Government Thinking Styles Inventory (MSG-TSI) (Sternberg & Wagner, 1991). Dai and Feldhusen (1999) found evidence for external discriminant validity and partial evidence for internal validity. Several other studies (e.g., Wu & Zhang, 1999; Zhang, 1999) used the MSG-TSI in Hong Kong and China and found good reliability.

Performance tests. Field dependence-independence is typically measured with performance tests. The Embedded Figures Test and Group Embedded Figures Test (Witkin, Oltman, Raskin, & Karp, 1971) are perceptual tests that show patterns to subjects to gauge their ability to distinguish shapes from their field (or background). People who can accurately single out different shapes from a variety of backgrounds are field independent. The Rod and Frame Test (Witkin, Dyk, Faterson, Goodenough, & Karp, 1962) is an apparatus test requiring perceptual judgments.

Product ratings. Kaufman (2001b) measured Bruner's (1986) narrative and paradigmatic styles by having participants write a sentence in response to an ambiguous photograph and then assigning scores for both thinking styles based on Bruner's definitions.

Predictors of cognitive styles. Among the factors that can be predictors of cognitive styles are domain-specific personality factors and group factors.

Domain-specific personality factors. There are several studies that suggest cognitive styles may be related to interests. Cognitive styles as measured by the MSG-TSI were found to distinguish, for example, accounting students (Tucker, 1999), and creative writers vs. journalists (Kaufman, 2001b). Field independent people tend to choose more mathematical and scientific professions, while field dependent people tend to choose more humanitarian professions (Witkin & Goodenough, 1977).

Group factors. Several studies show no gender differences in cognitive styles (Kaufman, 2001b; Riding & Rayner, 1998)

Cognitive styles as predictor. For all the attention they have received, there is surprisingly little evidence for the validity of cognitive styles. Sternberg's legislative style (1988, 1997), while uncorrelated with IQ and SAT scores (Sternberg & Grigorenko, 1993), has been found to predict academic task performance (Grigorenko & Sternberg, 1997). Field independence has been shown to correlate with measures of intelligence (Goldstein & Blackman, 1978), but negatively correlate with extroversion and emotional intelligence (Witkin & Goodenough, 1977). However, many of these findings are difficult to evaluate, because studies have generally failed to include controls for other ability and personality variables. Perhaps because of the lack of any systematic findings, particularly when ability and personality factors are controlled for, research on cognitive styles has declined considerably over the years.

Metacognition. Metacognition is knowledge about cognition, and metacognitive ability is one's ability to use that knowledge to learn, think, and solve problems more effectively. Knowing about and applying mnemonic strategies, such as elaboration and rehearsal, increases performance on memory tasks (Kliegl & Philipp, 2002). Knowing and employing effective heuristics (e.g., break into subgoals or consider the limiting case) increases problem solving performance. Study-skills courses taught in colleges are largely courses to improve metacognitive ability.

A distinction can be made between monitoring and regulating. Regulating refers to the selection of methods, such as planning or setting subgoals, for studying or solving problems. Monitoring refers to being aware of what one knows or what one has done in a problem solving situation (e.g., being aware of whether you know the meaning of a word, or being aware of whether you successfully completed a step in a task). Metacognition assessment has tended to focus on monitoring, while study-skills courses have tended to focus on regulation (e.g., learning strategies, scaffolding). An intriguing finding is that poor performers tend to lack awareness of their shortcomings (Ehrlinger & Dunning, 2003; Paulhus, 1998), leading to overconfidence and perhaps a tendency to fail to double-check their work, which itself could be the cause of errors. This failure to recognize incompetence may partly be due to individuals not being aware of errors of omission.

Measurement of metacognition. Among the different methods to measure metacognition are self-reports and performance tests.

Self-reports. Several authors have developed self-report instruments for general metacognitive abilities, but these generally have fared poorly psychometrically (Osborne, 1998; Schraw, 2001). This might reflect the domain-specific nature of metacognition.

Performance tests. Tobias and Everson (1995, 2000) developed a metacognition measure called the Knowledge Monitoring Assessment (KMA). It is a methodology for assessing metacognition rather than a test per se. It involves administering a test two times—first, to get examinees to predict whether they know the answer to each item, one by one; second, to actually try to answer the item. The match between the number they predict they will get right, and how many they actually get right is the basis for a metacognitive or knowledge monitoring score. The method is quite general and could be applied to just about any kind of testing situation.

Instead of asking one to predict whether they will get an item correct, one can ask them if they got an item correct immediately after they take it, in a kind of reverse KMA (or one can be asked to do both, as in the Jr. MAI method of Sperling, Howard, Miller, & Murphy, 2002) This is also called a confidence judgment, and it has been used in cognitive psychology for many years, often as a score intensifier (examinees get more credit if they solve a problem and are confident that their solution was correct [e.g., Lohman, 1980]). Recently Stankov (1999, 2000) has used this technique to investigate confidence as an individual-differences construct, finding that it is a factor separate from ability per se, a claim often made of metacognition.

Another method is the Over-Claiming Questionnaire (OCQ) (Paulhus & Bruce, 1990), which asks respondents to rate their familiarity with items from a list of general knowledge (cultural literacy) items (e.g., Manhattan project), some of which are sound plausible, but nonexistent foils (e.g., cholarine). The inclusion of foils allows for the determination of both accuracy (the ability to distinguish real items from foils) and bias (the tendency to say yes, even to foils). The accuracy measure from this procedure correlates with other ability measures as would be expected; the bias measure—which is the metacognition index—correlates with a self-enhancement personality scale (Paulhus & Harms, in press).

Predictors of metacognition. There several factors that can be predictors of metacognition. These include general personality factors, attitudinal factors, environmental factors, and group factors.

General personality factors. There ought to be a link between personality and metacognition because metacognition is an act of reflection on what one is doing, that is, being careful and avoiding impulsive behavior, which is a facet of conscientiousness (see the cautiousness facet of conscientiousness in Figure 2). However, outside of Paulhus and Harms' finding of a link between self-enhancement and overclaiming, we know of no empirical demonstration of this link for either knowledge monitoring or confidence.

Attitudinal factors. Little work has been done on the relationship between motivation and other factors and metacognition; Tobias and Everson (2002) see that as a major research need.

Environmental factors. Metacognitive strategies can be taught (Palincsar & Brown, 1987), and in fact, scaffolding methods, which essentially teach metacognitive strategies by supporting students through a problem solving attempt, then fading support over time, have begun to be routinely incorporated into computerized instructional programs (e.g., Katz & Bauer,

2000). However, the generality of such training is not clear. No work to our knowledge has been done on the trainability of increasing the accuracy of confidence judgments

Group factors. Metacognition is a skill that develops with age (Tobias & Everson, 2002). Women and men score similarly on metacognition. Little is known about racial differences.

Validity of metacognition. Metacognition as measured by the KMA has been shown to predict college reading, college and high school grades, and mathematical achievement (Tobias & Everson, 2002). However, the relationships are not strong, and there is an issue of the causal direction between metacognition and achievement: studies tend to be correlational. No external validity work has been done on confidence judgments.

Prospects for applied use in admissions decisions. Quasi-cognitive factors seem mostly susceptible to coaching and faking. Creativity and emotional intelligence have obvious desired outcomes: few schools would specifically seek a student who was not creative or scored low in EI. Metacognition and cognitive styles do not. But all four factors present problems for use in a high-stakes situation.

Creativity. Creativity measures would be problematic in high-stakes testing. Self-report measures could be coached; items tend to be obvious (e.g., "Has a vivid imagination"). Biographical data could be falsified or exaggerated (although it could be validated by a referee). Existing performance tests could be easily faked—most items depend on large quantities of responses rather than high quality, or else they depend on deviation from the norm. A student could be trained to fool both types of items. Product ratings are less susceptible, but much of the research conducted on these ratings has been in a laboratory setting. When students are given specific instructions and are asked to produce essays that are creative in nature, they produce work that is rated as more creative (O'Hara & Sternberg, 2001). The effect of such instructions (and eventual guides and preparation books) on the validity of ratings has not been studied. One kind of creativity measure that could be useful for admissions, would be an essay scored for creativity. Whether such a score would differ from a general writing score has not been examined.

Emotional intelligence. EI measures fall into two categories: self-reports and performance tests. Self-reports, as is true of the personality measures reviewed in a previous section, are coachable and fakable. Performance tests may present a possibility. The types of EI items most like existing cognitive tests, such as those involving vocabulary or concept

knowledge, are probably least susceptible to coaching. Some EI items have a situational judgment test format, in which an examinee's Likert-scale response is correlated with a reference group's (either the population or a group of experts) to get a score. This item format has proven useful for predicting job performance (McDaniel, Morgeson, Finnegan, Campion, & Braverman, 2001), but whether it is less susceptible to coaching than other item formats has not been studied extensively. Coachability may also depend on the reference group (population vs. expert), although it is not clear that the responses of one or the other would be easier to anticipate. In general, the more cognitive-based the scenario items are, the less likely these items will be coachable.

A further issue with EI is whether coaching may affect validity. If an EI test asks a student to describe what emotion a photographed face is expressing, then this item is trying to tap into a student's abilities to read emotion in other people. If this student has spent three hours studying different faces and what the correct label for their emotion is, then this item becomes a test of memory—not the originally intended purpose.

Another concern with EI measures focuses on the number of items available. There are a limited number of emotion-related vocabulary and concepts. Half of the MEIS (Mayer, Caruso, & Salovey, 1999)—judging synesthesia and understanding emotion—uses specific terms related to emotion. How many different items could be created to test the ways that a student understands emotion? It may indeed be possible to create the quantity of items required by a high-stakes test – but this question should be investigated.

Metacognition, confidence, and cognitive style. Use of these measures in high-stakes admissions seems problematic because there is not an obvious desired outcome. Is it better to be highly confident or to have more accurate meta-cognition? Is one cognitive style better than another? Coaching could influence performance tests for metacognition such as the KMA (e.g., instructing a student to say that he or she knows everything); however, for this coaching to be effective, there would have to be a clear outcome. Self-report tests of metacognition are less effective even without the issue of coaching and faking.

Thinking styles are also problematic. Field independence may be indistinguishable from general cognitive ability. Other styles have no obvious best, but because they are measured with self-reports, they are coachable (MSG-TSI) (Sternberg & Wagner, 1991). And most rating

measures of thinking styles, such as Bruner's (Bruner, 1986; Kaufman, 2001b) are designed to test a student's preference, not ability to use a given style. They, too, are undoubtedly coachable.

Summary. Creativity and emotional intelligence have inspired a great deal of theoretical interest, but little research has attempted to evaluate their use in selection or admissions in education or elsewhere. Both factors predict achievement and other outcomes, such as persistence (creativity), leadership (creativity and EI), and business success (EI). But it has not been demonstrated that such validity would be sustained in a high-stakes context.

As with other noncognitive factors, including emotional intelligence and creativity assessments in admissions would broaden the factors considered, with the additional benefit of reducing adverse impact against gender and racial groups. But highly reliable instruments have not yet been developed for either factor, nor has sufficient validity data been collected. There also may be more domain specificity for creativity and emotional intelligence (see Baer, 1998). Creativity may be particularly important for the humanities. Emotional intelligence may be particularly important for professions involving analysis and treatment of people, such as nursing, clinical psychology, and the like. It is also important to consider that creativity and EI are often seen as appropriate outcomes in their own right: A creative or emotionally intelligent student is a desirable one. Perhaps the ultimate role for these factors will be as criterion outcome measures, rather than as predictors of graduate school success.

Attitudinal Factors

In this section we review the key attitudinal factors of self-concept, self-efficacy, motivation, and interests. All of these factors relate to motivation in that they affect choice of activities, goals, strategies, effort, and persistence. They also tend to vary in context: People may see themselves as capable, interested, and willing to expend effort in an academic setting, for example, but inept, bored, and inclined to give up easily in an athletic one. Although the four factors largely reflect different literatures, they overlap conceptually, operationally, and empirically, and it seems productive to review them together.

Why are these factors important to understanding graduate student performance? It has been argued that performance depends on declarative knowledge, procedural knowledge, and motivation (McCloy, Campbell, & Cudeck, 1994). The GRE primarily reflects declarative and procedural knowledge. There is a need to understand attitudes that drive motivation. Further, attitudinal factors may provide important information about students who are traditionally

underrepresented in graduate programs; students for whom attitudinal factors may be particularly important (Zwick, 1991).

      Self-concept. Self-concept refers to "the way people characteristically think about themselves." (Brown, 1998, p. 3), either in general, or in a specific domain. Assessing domain-specific self-concept maximizes predictive validity (Vispoel & Wang, 1991). Thus, investigations of graduate student experiences focus on academic self-concept, defined as the extent to which a person has incorporated academic pursuits into his or her identity. A student's academic self-concept is often a critical factor in educational outcomes and is used as both an outcome variable and a predictor of achievement outcomes.

      Related to self-concept is the notion of domain identification. One is identified with a domain to the extent that one's performance within that domain is important to their self-concept. Doing well in a domain leads to feeling good about oneself (Steele, 1997), which in turn leads to motivation to achieve further in the domain. Students' academic self-concept and their identification with the academic domain affect the value they place on achieving and the behaviors they enact.

      Measurement of self-concept. There are several different methods to measure self-concept. These include self-reports, domain indentification, biographical data, performance tests, ratings, known groups, and observation.

      Self-reports. Self-concept is most often measured with self-reports. A widely used general self-concept scale is the *Tennessee Self-Concept Scale, Second Edition (TSCS: 2)* (Fitts & Warren, 1996), which assesses self-concept in the physical, moral, personal, family, social, and academic/work areas. It has been used in clinical settings to assess clients' general self-perceptions to target areas for therapy and remediation. The Self-Description Questionnaire (Marsh, Smith, & Barnes, 1983) measures multiple facets of self-concept (Marsh & Shavelson, 1985) in academic, social, and physical domains, with scales for physical abilities, appearance, relationships with peers, relationships with parents, reading, mathematics, and school subjects. Subsequent versions of the scale were designed specifically for the late adolescent population and high-school students (Marsh & O'Neill, 1984).

      Self-esteem measures, such Rosenberg's self-esteem scale (1979) can also be used to measure self-concept, or specifically, the worth people place on their self-concept. The scale

has proven to be a reliable and valid measure of self-esteem for Black students (Hughes & Demo, 1989).

Academic self-concept assessments measure the extent to which a student endorses academic attitudes and behaviors. A popular scale is the Dimensions of Self-Concept Scale Form H (DOSC) (Michael, Denney, Knapp-Lee, & Michael, 1984), which assesses noncognitive factors associated with self-concept and self-esteem in a college setting. The assessment comprises several subscales: level of aspiration, anxiety, academic interest and satisfaction, leadership and initiative, and identification versus alienation. A sixth factor, stress, was added to the scale to account for highly demanding domains (Paik & Michael, 2000). A sample item is, "I strive to be one of the best students in every class," with anchors at never and always. The scale was designed to identify students who may have difficulty in their schoolwork due to low self-esteem, to diagnose perceptions and activities that might contribute to low self-esteem, and to identify impaired learning capabilities for purposes of guidance or counseling. The DOSC has demonstrated promising concurrent validity with the Maslach Burnout Inventory (MBI) (Gold & Michael, 1985) a measure of burnout behaviors relevant to persistence. The DOSC has been modified and demonstrated to be valid for Chinese (Huang & Michael, 2000), Spanish (Menjares, Michael, & Rueda, 2000), Korean (Chong & Michael, 1999), and Japanese (Paik & Michael, 1999) language users. Other scales measure increasingly specific aspects of academic self-concept, such as the Mathematical Self-Concept Scale (Gourgey, 1982), which is designed to assess attitude toward one's ability to learn mathematics.

Self-concept scales also assess the extent to which students identify with their ethnic identity. Such information can be useful in understanding differences in academic goals, strategies and outcomes across and within different groups. Phinney (1992) created the Multi-group Ethnic Identity Measure (MEIM) to assess three aspects of ethnic identity: Positive ethnic attitudes and sense of belonging; ethnic identity achievement, including both exploration and resolution of identity issues; and ethnicity-related behaviors or practices. It has been used with high school, college, and graduate students.

Domain identification. Domain identification measures often overlap with both interest and academic self-concept inventories. For instance, identification versus alienation is a subscale of the Dimension of Self-Concept Scale, which taps students' level of identification with the school setting. Some studies have assessed level of domain identification by considering grades

or test scores within an area in conjunction with self-reported attitudes toward that domain (Aronson, Lustina, Good, Keough, Steele, & Brown, 1999; Walters, Shepperd, & Brown, 2004). For instance, Aronson et al. (1999) selected mathematics students with SAT® mathematics (SAT-M) scores above 550 to rate the importance of mathematics to their self-concept on a 15-point scale with anchors at not at all important to extremely important. Information about domain identification can also be gleaned from responses to interest inventories such as the Strong Interest Inventory (SII) (Harmon, Hansen, Borgen, & Hammer, 1994). See the Interests section.

Biographical data. Autobiographical essays, background questionnaires, or even interviews could be used to assess self-concept, as themes and repetition could be interpreted to reflect the student's personal identity. Biographical information itself might provide important information about a student's culture of origin, a factor often related to self-concept (Markus & Kitiyama, 1991). Myers (1999) suggests asking students to complete the sentence "I am…" with five statements, which are interpreted to reflect self-concepts.

Performance tests. Reaction time measures have been developed to measure implicit attitudes and associations, which provides advantages over explicit measures, which are susceptible to social desirability responding. The Implicit Association Test (IAT) (Greenwald & Banaji, 1995; Greenwald, McGhee, & Schwartz, 1998) measures one's associations of two target concepts with an attribute. Faster response to a concept paired with an attribute implies a stronger association between the two. Thus, one might measure an academic self-concept by looking at the associations between academic-related concepts and items and the self such as homework and self.

Ratings. Ratings have been used to measure self-esteem, but not self-concept. The assumption is that another cannot reliably know the content of a person's self-concept and the degree to which they possess an identity.

Known groups. To measure academic self-concept, academics could be compared to nonacademic professionals (e.g., businesspersons, attorneys) on a variety of other attitude measures; but, to our knowledge, this has not been done. Such a comparison might be useful, albeit somewhat speculative.

Observation. A school-based behavioral assessment might identify behaviors indicative of an academic self-concept such as class participation, avoiding procrastination, and class attendance. Clinicians may seek to understand the content of self-concepts for purposes of

identifying goals and possible blocks to achieving those goals. While this information is often gathered from conversation, active listening, and observation of academic behaviors, clinicians often use self-report measures such as the TSCS; Fitts & Warren, 1996) to assess self-concept.

In sum, self-report measures are likely the most viable and appropriate way to collect information about a person's self-concept. Other methods might serve to supplement this information. However, understanding the self-concept should not involve objective analyses or valence judgments. Rather, self-concept is a person's self-view and is, therefore, best captured by the person's own reports. Interviews with graduate students, open-ended descriptions of their graduate experiences, and questionnaires revised for the graduate experiences would be the most appropriate means of learning about graduate student academic self-concept and identification with the academic environment.

Predictors of self-concept. Several factors have been shown to predict whether a student possesses an academic self-concept. These include such factors as general personality, group, and environmental.

General personality factors. While little research has addressed the relationship between a person's self-concept and domain identification and general personality factors, it is reasonable to assume that certain stable factors will influence the formation of one's self-views, either directly or indirectly through others' reinforcement of particular self-views. For instance, a student who is high in conscientiousness may develop productive study habits, which in turn will lead to success and identification with the academic domain. Similarly, people's ratings on extroversion, neuroticism, agreeableness, conscientiousness, and openness will likely map onto some important component of self-concept.

Group factors. Black and Hispanic female graduate students in the 1970s consistently reported a lower academic self-concept than males (Hurtado, 1994). Within male-dominated doctoral programs, women expressed less of an academic self-concept than men (Uelkue-Steiner, Kurtz-Costes, & Kinlaw, 2000). Hurtado (1994) implicated low integration among groups of graduate students for these differences in self-views. However, others have found that incorporating the domain into one's self-concept depends on how efficacious the person feels in that area. Pajares and Miller (1994) found mathematics self-efficacy to mediate the effect of gender and prior experience with mathematics on self-concept as well as problem solving performance. Men had higher performances and self-concept, but these differences were

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accounted for by differences in self-efficacy. Gender directly related to prior experiences and self-efficacy. Thus, students may identify with a domain to the extent that they view themselves as capable in that domain. Among Black graduate students, academic self-concept was found to be negatively related to anxiety (Halote & Michael, 1984), implying that feeling anxious about one's ability to do well in an area might impede identification with that area.

Others have found that what determines an academic self-concept might vary with the students' environments. In an investigation of predictors of academic self-concept among Black college students HBCUs and predominantly White institutions (PWIs), Cokley (2000) found that the best predictor of academic self-concept for students attending PWIs was grade point average, while the best predictor of academic self-concept for students attending HBCUs was quality of student/faculty interactions. Additional analyses indicated that grade point average is significantly more important for the academic self-concept of Black students attending PWIs than for Black students attending HBCUs. Taken together, these studies indicate that self-efficacy in the domain is a primary predictor of developing an academic self-concept. However, institutional support and perhaps a role model within the domain can be equally important, especially among students of color.

Domain identification is particularly relevant to issues of gender and ethnicity within the education environment. It is commonly discussed in terms of group identity; the person views their group in relation to that context. Domain identification is often contrasted with feelings of alienation within a given domain, or disidentification, defined as "a reconceptualization of the self and of one's values so as to remove the domain as a self-identity" (Steele, 1997, p. 614). Disidentification either arises from external influences or from one's own intentional detachment. Crocker and Major (1989) incorporated domain disidentification into their strategies of self-esteem maintenance among stigmatized groups. They propose that people often disidentify from domains in which their group tends to fare poorly as a means of protecting their self-esteem. Hence, Black and Hispanic students in addition to other students whose group bears a negative academic stereotype often disidentify from the general academic domain, and women disidentify from mathematics and science domains. Steele (1997) argues that limited educational prospects for Black students and women, imposed on them by societal structure, frustrates their identification with their achievement within the academic domain. In understanding self-concept and domain identification as they relate to groups, it is important to consider the group's culture,

history, and relation to the dominant society. For instance, students who grew up in traditionally collectivist cultures such as Asia and Latin America will likely have a more interdependent sense of self, defined by social roles and relationships with others. Conversely, students from individualistic cultures such as the United States will more often develop an independent self-concept, defined by individual accomplishments, traits, and goals (Markus & Kitiyama, 1991). Ogbu and Stern (2001) describe community forces, the influences of a group's history of socialization, migration, and discrimination, as crucial to group members' orientation to the educational system.

Environmental factors. Consistent with assumptions that the self-concept is a product of one's experiences with the environment and with other people (Shavelson, Hubner, & Stanton, 1976), researchers have found a positive relationship between perceptions of faculty support and graduate students' self-concepts (Isangedighi, 1985). A mentor might enhance a student's academic self-concept by modeling academic behavior and by providing support, making the academic environment one that is comfortable and thus easy to identify with. This is consistent with evidence that faculty support predicts academic self-concept among Black students attending HBCUs, but not for those attending PWIs. One might argue that any student who makes it to the graduate level will possess a strong academic identity. However, different aspects of the environment may more or less fit with the students' self-concept. For instance, a student might be in a doctoral program for counseling psychology because helping people is an important part of his self-concept; but, he or she may not be as closely identified to the broader academic environment, including research.

Steele and colleagues (Steele, 1997; Steele & Aronson, 1995) have developed a program of research around *stereotype threat*, a situational performance pressure in which students who are highly identified with the academic domain are most susceptible (for more on this topic, see the Environmental Influences on Graduate School Outcomes section). The performance pressure often leads to suppressed performance in important academic areas, which ultimately can lead to disidentification from the domain. Several studies have revealed that modifications to high-stakes academic environments can diminish these adverse outcomes. For instance, variations on instructions (Steele & Aronson, 1995), ethnic and gender composition of the classroom (Inzlicht & Ben-Zeev, 2000), and ethnicity and gender of instructors and test administrators (Walters et

al., 2004) have all been found to reduce the situational pressure, and consequently, should reduce disidentification from the threatening domains.

Finally, prior academic experiences predicts self-concept within an academic domain, however, the relationship is mediated by self-efficacy (Pajares & Miller, 1994). Thus, the extent to which a person identifies with a domain will depend in part on prior experiences, which may or may not have created a personal sense of competence within that domain.

Self-concept as predictor. People select achievement goals that match their conceptions of themselves (Swann, 1990). Thus, students might choose to strive for a Ph.D. or another advanced degree in part because it reflects that they are high achievers. Tying goals to how we think about ourselves (e.g., I've always been a top student) increases the value we place on attaining that goal (Vallacher & Wegner, 1987), which affects the amount of effort we will expend (Oyserman & Markus, 1990). For instance, a positive self-view of succeeding at school (e.g., becoming an influential and venerated professor) provides a powerful incentive to work hard—especially when contrasted with a possible negative self-image of dropping out of graduate school.

Further, people who see a connection between their goals and a favorable self-concept within a domain persist longer at tasks than people who do not see such a connection (Markus & Nurius, 1986). For instance, among graduate students in education, self-reported academic self-concept was negatively related to reported burnout behaviors as measured by the Maslach Burnout Inventory (Gold & Michael, 1985). Among undergraduates majoring in mathematics- and science-related fields, only science self-concept emerged as a consistent predictor of second-year persistence for men and women (Carlin, 1998). As students progress through graduate school, they may reevaluate whether the end goal of attaining the degree continues to match with a desirable self-image such as scientist, professor, or lawyer. Moreover, among a wide sampling of doctoral students, academic self-concept predicted reported commitment to their chosen field (Uelkue-Steiner et al., 2000).

Self-efficacy. Bandura (1986, 1989) defined self-efficacy as a belief in one's ability to achieve success. Studies have found that self-efficacy is associated with educational success by influencing goal selection, intellectual engagement, effort, and persistence. This work has involved a wide range of ages and performance domains, and a substantial body of research has

focused on self-efficacy as a predictor, mediator and outcome variable associated with success in higher education.

Measurement of self-efficacy. Among the different ways to measure self-efficiency are self-reports and performance tests.

Self-reports. Self-report self-efficacy scales have evolved to encompass a wide variety of domains and populations. Scales range from general measures of self-efficacy to highly domain-specific scales. General scales include the Self-Efficacy Scale (Sherer, 1982) and the General Self-Efficacy Scale (Schwarzer, 1997), which was developed for use in several cultures. However, when the goal is to predict outcomes from self-efficacy beliefs, the assessment should be congruent with the outcome tasks (Bandura, 1986). For instance, self-efficacy for solving mathematics problems is a better predictor of solving mathematics problems than is mathematics self-efficacy in mathematics-related courses (Pajares & Miller, 1995). Moreover, global academic self-efficacy and domain-specific mathematics self-efficacy are separate, though related, latent dimensions (Lent, Brown, & Gore, 1997).

Therefore, measures of academic self-efficacy should be used to predict academic outcomes among graduate students, and even more specific scales can be used to predict increasingly narrow aspects of graduate school. For instance, Bandura's (1989) Multidimensional Scale of Perceived Self-Efficacy (MSPSE) includes several subscales, which cluster into three general factors: social efficacy, academic efficacy, and self-regulatory efficacy. All three factors can apply to specific areas of the graduate domain.

Several academic self-efficacy scales have been developed for use with undergraduate and graduate student populations. A widely used measure of self-efficacy in higher education is the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1993). The MSLQ taps into three broad areas related to efficacy: value (intrinsic and extrinsic goal orientation, task value), expectancy (control beliefs about learning, self-efficacy), and affect (test anxiety). Wood and Locke's (1987) Academic Self-Efficacy Questionnaire (ASE) assesses students' perceptions of their ability to perform tasks related to higher education. The ASE includes subscales that measure both in-class and exam concentration, memorization, understanding, explaining and discriminating among concepts, and note taking. Also, the College Academic Self-Efficacy Scale measures perceptions of academic ability among college students (Owen & Froman, 1988).

Other self-efficacy scales measure increasingly specific aspects of the academic environment. For instance, the Mathematics Self-Efficacy Scale (MSES), Forms A and B, measures beliefs about one's ability to perform various mathematics-related tasks and behaviors (Betz & Hackett, 1983). The Computer Self-Efficacy Scale assesses perceptions of computer-related knowledge and skills (Murphy, Coover, & Owen, 1989). The Career Decision-Making Self-Efficacy Scale (CDMSE) measures students' self-efficacy in their ability to make career decisions (Taylor & Betz, 1983). Some scales have been designed specifically for graduate students. For instance, the Research Training Environment Scale-Revised (RTES-R) is a measure of research interest and self-efficacy among counseling graduate students (Kahn & Gelso, 1997). Kahn and Miller (2000) developed the RTES-R-S, a shortened form of the RTES, which demonstrated adequate internal consistency and corresponded closely to total scores from the original RTES-R. Also, the Self-Efficacy Towards Teaching Inventory-Adapted measures efficacy among graduate student teaching assistants (Prieto & Altmaier, 1994). The Counselor Self-Efficacy Scale (CSES) was designed to assess skills and confidence in counseling activities for counseling graduate students (Baker, 1989). The scale first assesses whether the student can perform a behavior, and second how confident the student is in performing that behavior.

Other inventories address experiences of specific groups. For instance, Solberg, O'Brien, Villareal, and Davis (1993) developed an assessment for Hispanic students' self-efficacy for adjusting to the college environment. Self-Efficacy Expectations for Role Management (SEERM) assesses women's perceptions of efficacy for managing multiple roles such as parent and spouse/partner in addition to worker or student (Lefcourt, 1996).

Performance tests. Students' responses to scenario items may also reveal feelings of self-efficacy. Considering that students are more likely to avoid tasks in which they feel low self-efficacy and to approach tasks in which they feel high in self-efficacy (Bandura, 1986), students' decisions to approach a hypothetical performance task may provide information about their self-efficacy beliefs within that domain.

Predictors of self-efficiency. Several factors can be predictors of self efficiency. These include such factors as group, environmental, and personality.

Group factors. Students of color generally have lower graduation rates than do their White counterparts in undergraduate (Bowen & Bok, 1998) and graduate programs (Zwick, 1991), and several studies suggest that self-efficacy may play an important role in these group

differences. Self-efficacy is a primary predictor of academic persistence among Black undergraduate students attending PWIs (Steward & Jackson, 1990; Tracey & Sedlacek, 1984). Further, self-efficacy predicted academic performance among Black undergraduate students at HBCUs (Wilson, 1997). However, Black female students who reported having encountered negative racial attitudes reported lower academic self-efficacy (Byars, 1998). Taken together, this research suggests that Black students who report high self-efficacy will have greater academic success and persistence, but this efficacy can be undermined by experiences with negative group stereotypes.

Self-efficacy is a particularly important issue for women pursuing fields in which they have traditionally been underrepresented such as science, mathematics, and engineering. An investigation of women graduate students for the National Academy of Sciences found a lack of adequate preparation for women entering quantitatively oriented programs and diminished self-efficacy (Dix, 1987). However, among science and engineering graduate students, expectations about student/faculty interactions were a more significant predictor than was gender for academic self-efficacy (Santiago & Einarson, 1998). Thus, supportive faculty members might enhance efficacy among women in quantitative fields. Further, Pajares and Miller (1994) found mathematics self-efficacy to be more predictive of mathematics achievement (as measured by problem solving) than was gender or prior experiences. Self-efficacy also mediated the effect of gender and prior experiences on mathematics self-concept and problem solving. This research suggests that enhancing self-efficacy may be pivotal for maximizing performances for women in quantitative fields.

Self-efficacy also influences the academic outcomes of nontraditional students, students who are older than average students, and those who have multiple life roles. Undergraduate nontraditional students (aged 25 years and older) showed the strongest positive correlation between academic self-efficacy and GPA (Tiner, 1995). Sandler (1999) found that the Career Decision-Making Self-Efficacy Scale (CDMSE) of Taylor and Betz (1983) predicted persistence among nontraditional doctoral students (typically defined as aged 30 years and older), indicating that confidence in the career choice may be an incentive to persist in training for the chosen career path. However, multiple role conflict negatively related to academic self-efficacy among graduate students (in educational research courses) (Feldmann & Martinez-Pons, 1995). Thus,

self-efficacy is highly important to outcomes of nontraditional students, but these feelings may be lessened by excessive external demands such as family and professional roles.

Environmental factors. Among graduate science and engineering students, student perceptions of preparedness and student-faculty interactions were strong predictors of academic self-efficacy and career-related outcome expectations (Santiago & Einarson, 1998). Among doctoral students from the College of Education, research self-efficacy was best predicted by perceptions of a supportive relationship with their advisor (Faghihi, 1998). Also, education students who held graduate assistantships reported more research self-efficacy than did students without assistantships (Faghihi, 1998). For doctoral candidates, research self-efficacy was an important factor in academic goal achievement and degree attainment. Students often reported high efficacy in the literature review of their dissertation, but low efficacy in the research design and analysis component of their research. Performance in statistics independently accounted for a high degree of the variance in self-efficacy (Bako-Okolo, 1996). Thus, doctoral students who do not feel competent in the technical and research aspects of their dissertation may be least likely to complete their dissertation.

Personality factors. Self-efficacy is often a key component to research on interests and personality. People may develop an interest in areas in which they feel that their likelihood of success is high (Lent, Brown, & Hackett, 1994). For instance, vocational interest was a strong predictor of academic self-efficacy among students in engineering and science (Hackett, Betz, Casas, & Rocha-Singh, 1992). Scientist interest predicted research self-efficacy among doctoral students in counseling psychology (Geisler, 1996). Among graduate students in counseling psychology, research self-efficacy was positively correlated with positive attitudes toward the research-training environment (Phillips & Russell, 1994).

Self-efficacy scales have begun to be used in conjunction with interest measures in vocational counseling. Self-efficacy in an area of interest is considered to be an important aspect of vocational decision-making. For instance, the Strong Interest Inventory can be supplemented by the Skills Confidence Inventory (SCI) (Betz, Borgen, & Harmon, 1996). The SCI consists of ten activities, termed *general confidence themes*, relevant to the six Holland (1959, 1973) types. Respondents rate the extent to which they feel confident in their ability to complete each activity. An interest/self-efficacy pattern emerges as part of the overall strong interest profile.

Self-efficacy has also been shown to relate to specific personality factors. For instance, Carver and Scheier (1982a) found that people who are high in private self-consciousness are more likely to persist on a task only when they feel efficacious in the task domain. Among privately self-conscious people, self-efficacy predicts superior performances (Brockner, 1979; Carver & Scheier, 1982b). Further, optimism significantly predicted self-efficacy among undergraduate students (Chemers et al., 2001). Moreover, Judge, Locke, and Durham (1997) proposed that emotional stability (low neuroticism), generalized self-efficacy, locus of control, and self-esteem comprised core self-evaluations, and a higher order construct. In a meta-analysis of the relationships among these variables, generalized self-efficacy and emotional stability showed a strong positive correlation (Judge & Bono, 2001). However, in an analysis of responses to Eysenck's Personality Questionnaire, efficacy measures were unrelated to introversion, neuroticism, and psychoticism (Eysenck & Eysenck, 1991).

Self-efficacy as predictor. Self-efficacy exerts a strong influence on academic performance through its influence on the goals people select and the behaviors they enact toward those goals. For instance, people select academic goals in which they believe that there is a high likelihood of succeeding. In an analysis of undergraduates, high self-efficacy (as measured by the Academic Self-Efficacy Scale, Wood, & Locke, 1987) predicted high personal academic performance goals (i.e., grades), and performance goals and ability were related to actual course performance. People who are high in self-efficacy are also more likely to adopt goals related to acquiring knowledge (learning goals) as opposed to simply performing well (performance goals) (Greene & Miller, 1996) (for more on this, see the Motivation section). Zimmerman and Bandura (1994) found perceived academic self-efficacy to influence writing grade attainments for college freshman by fostering the adoption of learning goals for writing skills. Goal selection, then, affects performance outcomes. Greene and Miller (1996) found that self-efficacy and learning goals predicted meaningful cognitive engagement, which in turn influenced achievement.

Self-efficacy is also apparent in the strategies that people adopt to reach their academic goals. For instance, people who have high self-efficacy adopt more efficient and sophisticated problem solving strategies (Bandura & Wood, 1989), and develop more effective time management skills (Moore, 1995). People with high self-efficacy also seek more information and spend more time practicing toward achieving their goals than do people with low self-efficacy. They also work harder and persist longer at tasks, particularly in the face of obstacles (Bandura,

1986, 1989). Numerous studies have demonstrated the affect of self-efficacy on college and graduate school performance. Among doctoral students from the College of Education, research self-efficacy contributed to dissertation progress (Faghihi, 1998). Among counseling doctoral students, research self-efficacy predicted research productivity and science-related career goals (Kahn & Scott, 1997). Self-efficacy was the most influential predictor of dissertation progress among doctoral students in counseling psychology programs (Geisler, 1996), and the strongest predictor of academic achievement among engineering and science undergraduates (Hackett et al., 1992). Among college freshman, academic self-efficacy and personal goals predicted exam performance (Vrugt, Hoogstraten, & Langereis, 1997). In an analysis of a wide range of possible predictors, self-efficacy contributed significant unique variance to the prediction of grades and persistence among undergraduates considering technical and scientific fields (Lent, Brown, & Larkin, 1986).

Students' perceived self-efficacy has been found to be highly predictive of academic outcomes within a wide range of educational domains. For instance, self-efficacy predicted performance in reading comprehension (Schunk & Rice, 1993; Shell, Colvin, & Bruning, 1995), writing (Graham & Harris, 1989; Pajares & Johnson, 1996; Schunk & Swartz, 1993a, 1993b; Shell et al., 1995), mathematics (Pajares & Kranzler, 1995; Pajares & Miller, 1994, 1995), and performance on a computerized, high-stakes certification examination for male Certified Netware Engineer TM candidates (Mulkey, 1997). Perceived self-efficacy mediates performance in these areas, in large part, due to its influence on choice of activities, goal setting, strategy selection, task persistence, and help-seeking behaviors (Bandura, 1986; Schunk, 1991; Zimmerman & Martinez-Pons, 1990).

Generalized self-efficacy was one of four components of Judge et al.'s (1997) core self-evaluation construct, which is significantly related to job satisfaction and performance (Judge & Bono, 2001; Judge, Locke, Durham, & Kluger (1998). Further, both domain-specific self-efficacy (Stajkovic & Luthans, 1998) and generalized self-efficacy (Judge & Bono, 2001) are independently positively related to both job satisfaction and job performance.

Motivation. "There are three things to remember about education," former Secretary of Education Terrel Bell said. "The first is motivation. The second one is motivation. The third one is motivation" (Maehr & Meyer, 1997; cited in Covington, 2000, p. 171).

Current theories of motivation are concerned with beliefs and cognitions (Eccles, Wigfield, & Schiefele, 1998), seeing motivation as "the decision to act, the intensity of the action, and the persistence of action" (McCloy et al., 1994). A key distinction in the motivation domain is between intrinsic and extrinsic motivation. Intrinsic motivation is performing an activity for enjoyment. Extrinsic motivation is performing an activity for an external reason (e.g., a reward or public recognition) (Deci & Ryan, 1980, 1985). One conceptualization of intrinsic motivation is Csikszentmihalyi's (1988, 1990) conception of flow. Flow is an optimal experience—defined as the sensations and feelings that come when an individual is actively engaging in an intense, favorite pursuit. This could be anything from rock climbing to playing the piano. An individual's abilities must match the potential challenges of the situation to enter the flow state—someone who never played the piano would not consider trying to master Beethoven as a flow state; and a concert pianist would not enter the flow state trying to play "Mary Had a Little Lamb" (Csikszentmihalyi, 1990).

Another intrinsic motivation idea is effective motivation. If an individual succeeds at a task and is rewarded, then the reward is internalized, increasing intrinsic motivation (Harter, 1981). Another idea is self-determination (Deci & Ryan, 1985), which is that because of our need for competence, we prefer optimal challenges to increase skills. Intrinsic motivation occurs when we are both interested in the activity and self-determined.

Motivation can depend on our goals. Performance goals can be distinguished from learning goals (Nicholls, 1979). When the goal is performance then the way we respond to difficult tasks depends on our perceived ability. With a high level of perceived ability, difficulties are handled with an effective problem solving approach, referred to as performance-approach. With a low level of perceived ability, there is a learned-helpless response, referred to as performance-avoidance (Elliot & Church, 1997; Middleton & Midgely, 1997). In contrast, when the goal is learning, there is a mastery orientation response to difficulty regardless of the perceived level of ability (Elliott & Dweck, 1988). Zwahr-Castro (2000) found that goals served as a mediator for motivation, with mastery goals mediating achievement needs and intrinsic motivation and both performance-avoidance and performance-approach goals mediating fears of failure and intrinsic motivation.

Measurement of motivation. Several methods can be used to measure motivation: self-reports, biographical data, performance tests, ratings/product ratings, known groups, and observation.

Self-reports. One direct measure of intrinsic and extrinsic motivation is Amabile's (1995) Work Preference Inventory (WPI) . The WPI is a set of thirty self-report items that are rated never true, sometimes true, often true, and always true. These items include "I am keenly aware of the GPA goals I have for myself" and "What matters most to me is enjoying what I do." These items produce an intrinsic motivation and an extrinsic motivation score. The WPI has been found to have internal consistency, test-retest reliability, and is correlated with other behavioral measures of motivation (Amabile, Hill, Hennessey, & Tighe, 1994). Other self-report measures that are related to the construct of intrinsic motivation include the Academic Motivation Scale (see Cokley, 2000), Achievement Goals Questionnaire (Elliot & Church, 1997), the Situational Motivational Scale (see Guay, Vallerand, & Blanchard, 2000), and the Student Interest and Experience Questionnaire (Amabile, 1989).

Biographical data. Biographical data is not often used in empirical studies of motivation, although there is a suggestion that it could be used to make judgments about an individual's motivation (Brown & Campion, 1994).

Performance tests. While the authors of the School Motivation Analysis Test (Sweney, Cattell, & Krug, 1970) refer to it as an objective (i.e., performance) test, the methodology places it closer to self-report (although the scoring system claimed to eliminate scorer bias and social desirability).

Ratings/product ratings. Another method of assessing a student's motivation is to ask his or her teacher to give a rating of motivation. One standardized method of getting these ratings is to use the Teacher Rating of Academic Achievement Motivation (TRAAM) (Stinnett, Oehler-Stinnett, & Stout, 1991). The TRAAM has been shown to have construct validity with self-report measures of motivation (Stinnett & Oehler-Stinnett, 1992) and to have higher predictive validity for SAT scores than other self-report measures (Schuck, Oehler-Stinnett, & Stout, 1995).

Known groups. The use of known groups is not as commonly used in the assessment of motivation due to the lack of clear criteria for selection; people can only easily be divided up into groups based on motivational orientation if they are already tested or previously observed. However, known groups can be used in experimental studies that offer an external reward to one

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group of participants—thereby, according to Deci and Ryan (1985), making these participants more extrinsically motivated—and not offering an external reward to a different group of participants.

Observation. There are two ways that observation plays a role in the assessment of motivation. One way is to present participants with a task that is presumed to be inherently enjoyable, such as drawing pictures or solving puzzles (e.g., Lepper, Greene, & Nisbett, 1973) and then offer them an extrinsic reward for completing the task. Participants are then observed when they are not being rewarded to see if they still choose to engage in the tasks. Participants who choose to spend time on the tasks even when no reward is present are presumed to be more intrinsically motivated to engage in the task, while those participants who do not spend time on the tasks are presumed to be more extrinsically motivated.

A second way to use observation in the assessment of motivation is to observe teachers and students in a classroom setting and then drawing conclusions about motivational factors such as goals and effort is another method that has been used to assess motivation (Barlia, 1999; Brookhart & DeVoge, 1999). Usually, these observations are conducted in conjunction with other assessments, such as self-report inventories.

While these traditional measures are the most common way of assessing a student's motivation, it is important to note that these measures do not take into account the broader context in which a student's motivation may be present. Students who are members of minority groups, for example, may be influenced by a wide array of factors that pertain specifically to their social group (such as societal rewards and pressures), and these factors may not reflected in commonly used measures (see Ogbu, 2001).

Predictors of motivation. There have been few studies that have directed examined the relationship of intrinsic versus extrinsic motivation and the Big 5 personality factors. One study that administered the WPI and the NEO-PI to a sample of college students found that openness to experience was significantly positive correlated with intrinsic motivation, while openness to experience and agreeableness were significantly negatively correlated with extrinsic motivation (Kaufman, 2001b). Learning styles associated with achievement motivation (meaning-directed, reproduction-directed, and application-directed) were also found to be correlated positively with conscientiousness, extraversion, openness to experience, and agreeableness and to be correlated negatively with neuroticism (Busato et al., 1999). Extraversion was also found, however, to be

associated with sensitivity to signals of reward and generalized reward expectancy, two aspects of extrinsic motivation (Zuckerman, Joireman, Kraft, & Kuhlman, 1999). A study of intrinsic and extrinsic career success—measuring such variables as job satisfaction for intrinsic, and salaries and job level for extrinsic—found that extroversion was positively correlated with intrinsic success, neuroticism and conscientiousness were negatively correlated with intrinsic success, and agreeableness was negatively correlated with extrinsic success (Boudreau, Boswell, & Judge, 2001).

Motivation as predictor. Mastery goals lead to mastery orientations and intrinsic motivation; this combination leads to better graded performance (Church, Elliott, & Gable, 2001). Performance goals lead to negative affect and decreased working memory, while mastery goals lead to positive affect and increased working memory (Linnenbrink, Ryan, & Pintrich, 1999). Performance goals are less negatively associated with these outcomes with male students and with older students (Midgely, Kaplan, & Middleton, 2001).

Sometimes, goals have an indirect effect on achievement. Among undergraduates, perceived ability (self-efficacy) and mastery learning goals influenced meaningful cognitive engagement, which in turn influenced achievement. Performance goals predicted shallow processing which negatively influenced achievement (Greene & Miller, 1996). In addition, students with mastery goal orientations used more effective strategies, preferred challenging tasks, had a more positive attitude toward the class, and a stronger belief that success follows from effort. Performance goals were related to a focus on ability, and evaluating their ability negatively (Ames & Archer, 1988).

Intrinsic motivation has long been associated with task persistence. Indeed, many of the central studies that defined the construct of intrinsic motivation (e.g., Lepper et al., 1973) used persistence in a task as the criteria for whether an individual was intrinsically motivated—if an individual persisted in solving a puzzle or playing a game, then he or she was considered to enjoy doing the task, and was therefore considered to be intrinsically motivated. Several other studies (e.g., Reeve & Nix, 1997; Seth, 1996) have included a measure of persistence as an additional measure in a larger study, and these studies have consistently found intrinsic motivation to be related to higher levels of persistence.

Structured interviews with 22 graduate students revealed that they felt there was more structure and direction associated with coursework than with the independent activity required to

complete a dissertation. Thus, a student needs to be highly self-motivated and self-directed to successfully complete their degrees (Kluever & Green, 1998). Culture is also an important aspect to consider here, however, as high self-motivation may not manifest itself in school performance in all cultures (Suarez-Orozco & De Vos, 1994).

There is a large literature on the impact of motivation on creativity, much of it focused on the distinction between intrinsic and extrinsic motivation. The research of Amabile and her colleagues (Amabile, 1979, 1982, 1996; Amabile & Gitomer, 1984; Amabile et al., 1986; Amabile et al., 1994) argued that intrinsic motivation (performing an activity out of enjoyment for that activity) is more conducive to producing creative work than extrinsic motivation (performing an activity for an external reason, such as a reward; see Deci & Ryan, 1980, 1985; Lepper et al., 1973).

Amabile (1985) studied the effects of an intrinsic versus extrinsic motivational orientation on creative-writing graduate and undergraduate students. Participants in this study first had to write a poem to establish a baseline of creative writing. She then gave them a list of reasons for writing. One group received lists that stressed extrinsic motivation (i.e., "You want your writing teachers to be favorably impressed with your writing talent," "You know that many of the best jobs available require good writing skills"), while another group received lists that emphasized intrinsic motivation (i.e., "You enjoy the opportunity for self expression," "You like to play with words"). Amabile had the students rank-order these reasons, and then write a second poem. Outside raters evaluated both poems. The students who were given the list of intrinsic reasons to rank, as well as a control group that received no lists, showed no significant difference in the ratings of creativity. The students given the extrinsic list, however, were rated significantly lower on their second poem.

Ruscio et al. (1998) examined which task behaviors best predicted creativity in three domains (problem solving, art, and writing). The most important indicator was found to be a participant's involvement in the task, as measured through behavioral coding and think-aloud protocol analysis. Other predicting factors differed by domain. In the domain of writing, which was measured with a Haiku poem-writing task, the other central indicator of creativity was a factor called *striving*. Striving was comprised of difficulty, transitions, questioning how to do something, repeating something, and positive and negative exclamations.

In addition, Amabile et al. (1986) looked at the effect of reward on student creative performance. They had a reward and a no reward condition, and then had a second condition as to how the task was presented—work, play, or no label. In the reward condition, the children were offered the use of a Polaroid camera, a desirable activity for these children, if they would promise to tell a story later. In the no-reward condition, the children were also allowed the use of a Polaroid camera, but this was presented as merely another task, not as a reward for future activity. After the children in all conditions took photographs, they were then asked to tell a story, based on a picture book. In the work condition, the story-telling task was labeled work, while in the play task it was labeled play. The no-label condition did not use a label for the storytelling activity. These stories were then judged by outside raters. Amabile et al. (1986) found that children told more creative stories if they were in the no-reward condition, while no significant effect was found for the task labeling condition.

The harm to creativity from rewards may be minimized. Students who received intrinsic motivation training (such as directed discussion sessions that focused on intrinsic reasons for performing the task in question) before performing a task and receiving a reward showed less negative effect (Hennessey, Amabile, & Martinage, 1989). Yet Cooper, Clasen, Silva-Jalonen, and Butler (1999) found that even with set in an intrinsically motivating context, rewards had a negative impact on performance.

Although extrinsic motivation can impair creativity, intrinsic motivation can enhance creativity. Greer and Levine (1991) found that students given an intrinsic motivation introduction wrote poems that were judged to be more creative than those produced by a control group.

Recently, however, some reviews of the motivation research have challenged the assertion that intrinsic motivation is linked to higher performance (and increased creativity). Cameron and Pierce (1994) conducted a meta-analysis of 96 experimental studies involving the effects of reward on intrinsic motivation, and found that the only negative effect came from a reward being tangible, expected, and given for the performance of a simple task. Eisenberger and Cameron (1996) argued that rewards (which result in extrinsic motivation) are not necessarily detrimental to performance. They stated that the detrimental effects occur under restricted and avoidable conditions and that reward can often have a positive effect on creativity. Further studies have shown that intrinsic motivation and creativity were not negatively affected by a reward (particularly a verbal reward), and could actually be improved, if the reward was

presented in a less salient manner, especially in tasks requiring divergent thinking (Eisenberger & Selbst, 1994). Eisenberger, Armeli, and Pretz (1998) found that a promised reward increased creativity if students received training in divergent thinking, or if instructions emphasized the need for creativity, while Eisenberger, Haskins, and Gambleton (1999) found that rewards increased creativity if the students had prior experience with creative acts.

There has been extensive research on the potential benefits of intrinsic motivation and the potential harm of extrinsic motivation; while it certainly appears that there is an association between increased intrinsic motivation, decreased extrinsic motivation, and higher levels of creativity, the nature and extent of these associations has not yet been fully determined.

Motivation may depend on a student's culture of origin. For example, the intrinsic-extrinsic distinction might be particularly important in individualistic cultures, which emphasize the value of achieving for one's own personal satisfaction. Individuals from collectivist cultures value group connectedness and may be more motivated by variables such as group harmony (De Vos & Suarez-Orozco, 1990; Markus & Kitiyama, 1991). Free choice is an important variable in increasing intrinsic motivation. Recent work has shown that personal choice is less important for an Asian child's motivation that an American child's motivation (Iyengar & Lepper 1999).

In a related vein, researchers have noted that achievement motivation may depend on whether a group's migration to the United States was voluntary as opposed to involuntary (Ogbu, 2001; Ogbu & Simons, 1998). For example, traditional voluntary migrants were able to learn that academic achievement is the key to upward social mobility and were able to quickly adopt this value as their own. In contrast, nonvoluntary migrants may not have experienced such a continuous link between education and success.

The empirical picture is mixed. A number of studies have found no gender differences in intrinsic or achievement motivation in samples of returning college students (Sachs, 2001), White and Black junior high school students (Forkner, 2001), Asian American and White medical students (Krishnan & Sweeney, 1998), and Hispanic junior high students (Badiozamani, 1995). Other studies have found no race/ethnic differences in motivation between Black and White students (Forkner, 2001), Asian and White students (Chun, 2000), and Irish and American business students (De Pillis, 1999). The impact of intrinsic motivation may vary with gender and race; women are more likely to produce less creative work, for example, under extrinsic constraints (Baer, 1997), and male students have been found to have lower verbal motivation and

higher mathematics motivation than female students (Skaalvik & Rankin, 1994). As mentioned, Anglo American students showed less intrinsic motivation when decisions were made for them by other people, while Asian American students showed more intrinsic motivation (Iyengar & Lepper, 1999).

Attributions. Attributions concern the nature of the source to which one attributes successes and failures. For example, after receiving a good grade on an essay assignment, a student might attribute that grade to either her own hard work (internal) or to good instruction (external). The student might also believe that she can repeat the success because she is a good essay writer (stable) or that sometimes she's on and sometimes off when it comes to essay writing (unstable). The student might believe the performance to be something she can maintain as long as she works hard and concentrates (controllable), or that essay writing is a matter of inspiration, which might or might not be present when the assignment is due (uncontrollable). The student could believe that her essay writing skills are general to any topic (global) or that they are domain specific—that she could be a good essay writer in political theory, but a poor one in cosmology (local). These conceptions stem from Rotter's (1966) work on locus of control (internal vs. external), later extended by Weiner (1985) and Seligman and colleagues (Abramson, Seligman, & Teasdale, 1978; Seligman & Schulman, 1986), and are referred to variously as explanatory style and attributional style.

Measurement of attributions. Among the ways to measure attributions are self-reports and performance tests.

Self-reports. The most widely used instrument is Peterson, Semmel, von Baeyer, Abramson, Metalsky, and Seligman's (1982) Attribution Style Questionnaire (ASQ), which consists of 6 positive and 6 negative hypothetical events to which the examinee determines a likely attribution from among several alternatives. Alternatives vary along the dimensions of internality, stability, and globality.

Because the dimensionality of attributional styles is well researched and fairly straightforward, it is not too difficult for an investigator to develop an attributional style questionnaire for specific domains, or for specific research purposes. For example, Emmerich, Rock, & Trapani (2004) developed the Teacher Attribution Inventory—Short Form (TAI-S) to measure characteristic attribution patterns for teachers in a study of determinants of teaching success. The instrument assesses causal attributions for a successful and for an unsuccessful

teaching event. It consists of explanations varying in internality, stability, and controllability (internal-stable-controllable, external-unstable-uncontrollable, etc.), and also strong vs. weak susceptibility to self-enhancement.

Performance tests. The content analysis of verbatim explanations (CAVE) technique involves analyzing speeches or writings of an individual to assess attribution style. The method has been applied to studying politicians from a distance (Zullow, Oettingen, Peterson, & Seligman, 1988), as well as students and others in a more conventional assessment setting (Schulman, Castellon, & Seligman, 1989). CAVE assessments are comparable to (i.e., highly correlated with) ones made with self-reports (Shulman et al., 1989).

Attributional style as predictor. An adaptive attributional style is one that increases task effort and persistence. What is adaptive depends on whether the attributions follow a success or failure experience (Graham & Weiner, 1996). Following a success, an adaptive attributional style is one in which the cause of the success is seen as internal (something about me), stable (it will stay this way), and controllable (something I made happen). Following a failure, an adaptive style is one in which the cause of the failure is seen as internal, unstable (I can change it), and controllable.

A line of research that has demonstrated the importance of adaptive attributions is the studies of Dweck and colleagues of the effects of thinking of intelligence as a fixed entity vs. intelligence as a modifiable characteristic (Dweck & Leggett, 1988; Dweck & Sorich, 1999; Licht & Dweck, 1984). This research investigates students' responses to academic obstacles and setbacks. They found some students responded with renewed enthusiasm to obstacles, while others responded with helplessness and resignation. They related this to the views the students' held about the nature of intelligence. Students who view intelligence as malleable view obstacles as challenges, in a mastery-oriented coping style. They see hard work as the key to achieving success. Students who believe that intelligence is a fixed entity respond with helplessness to obstacles, and believe that no amount of effort can improve their station. These differences in theories about intelligence can have a profound effect on academic achievement through their effect on the goals a student adopts. Students who hold entity beliefs about intelligence adopt performance goals, wherein their goal is to secure favorable views from others via good grades and praise. Students with a mastery orientation adopt learning goals, in which their objective is to increase competence.

Interests. Lent, Brown, and Hackett (1994) define vocational interests as "patterns of likes, dislikes, and indifferences regarding career-relevant activities and occupations" (p. 80). Like most explanations of interests in the literature, this definition is operational rather than conceptual. As a consequence, most studies have focused heavily on the development of psychometric scales to predict career-related outcomes as opposed to theoretical developments of interest as a construct (Savickas, 1999). Extensive research has proven the usefulness of interest inventories in predicting important vocational and academic outcomes.

Research on vocational interests has proliferated over the past seven decades. Studies have typically looked at the match between a person and a job, and the relation of that fit to outcomes such as job performance and satisfaction. Holland's (1959, 1973) model of vocational interests has provided an important framework for assessing this person-environment fit. He proposed that interests map onto six personality types: realistic, artistic, investigative, social, enterprising, and conventional. Each type relates to environments that promote certain attitudes and abilities. For instance, realistic types prefer environments that capitalize on realistic skills such as mechanical abilities; investigative types like investigative endeavors such as mathematics and science. Artistic types prefer writing, musical and artistic activities, while social types like activities that highlight their social skills such as teaching and counseling. Enterprising types prefer activities that capitalize on leadership and communication skills such as sales; conventional types like areas that require clerical and arithmetic abilities, such as bookkeeping.

Interest as a construct has dominated the field of vocational psychology, but has also been shown to have a substantial impact on academic performance. For example, interest in a particular academic domain relates to feelings of efficacy in that domain as well as productivity. Why may interests be particularly important to the graduate student domain? In a recent meta-analysis of the validity of the Graduate Record Examination, Kuncel et al. (2001) point to the superior predictive validity of the GRE subject tests over the GRE general test on academic performance and persistence. Termed the *interest hypothesis*, the authors speculate that the subject tests may be measuring interest in a given subject matter, and the subsequent motivation to study and master that field. Thus, performances on the subject tests may be a product of acquired knowledge and ability as well as interest and motivation. In sum, while the GRE-V and

GRE-Q are primarily tests of ability, interest measures may be better predictors of motivationally determined aspects of graduate student performance such as effort and persistence.

Measurement of interests. Among the ways to measure interests are self-reports, performance tests, and biographical data.

Self-reports. Self-report tests are the most common way of measuring interests. Several scales have emerged from over 70 years of research, and currently reflect aspects of Holland's (1959, 1973) theoretical framework. The Strong Interest Inventory (SII) (Harmon et al., 1994) is the most often used interest assessment tool (Watkins, Campbell, & Nieberding , 1994). The scale is the culmination of continual updates and revisions of previous forms and is consequently extremely well researched and considered to be the most scientifically grounded interest assessment tool (Prince & Heiser, 2000). Previous versions of the SII include the Strong Vocational Interest Inventory (SVII) (Campbell & Hansen, 1981) and the Strong-Campbell Interest Inventory (SCII; Campbell & Hansen, 1981). The SII measures respondents' work and personal interests and compares them to other people employed in a wide range of occupations. The scale is organized along four levels of scales. First, general occupational themes reflect Holland's (1959, 1973) six types. Basic interest scales measure specific interests related to each occupational theme. For instance, agriculture reflects a basic interest item within the realistic occupational theme. Occupational scales reflect specific occupations such as physicist or fiction writer. Finally, the personal style scales include a work style scale, a learning environment scale, a leadership style scale, and a risk-taking/adventure scale.

The Campbell Interest and Skill Survey (CISS; Campbell, Hyne, & Nilsen, 1992) also emerged from the Holland tradition. The CISS matches self-reported interests and self-assessed skills to occupations. The incorporation of skills into interest measures was highly innovative in that it integrated self-confidence into the assessment. Respondents rate their level of interest and level of skill on each item using a free response format, six-point scale. Interest and ability scores are assessed for several scales, which are similar to the SII, but focus on workplace activities and include additional scales such as academic focus and extraversion scales. The CISS was designed to be easier for practitioners to use and more sensitive to test taker diversity than previous interest measures. CISS outcomes are presented as the following patterns: pursue (high interest-high skill), develop (high interest-lower skill), explore (lower interest-high skill), and avoid (low interest-low skill).

Other interest inventories have been designed for individual use without the intervention of a vocational counselor. For instance, after the eventual refinement of his six types, Holland designed the Self-Directed Search (Holland, 1994) as a tool that would be easy for people to use to assist individuals in finding occupations that match their interests and skills. Respondents complete a series of scales (activities, competencies, occupations, and self-estimates) as well as an occupational daydreams section, which measures Holland's six types. Based on responses to the scales, the individual can calculate a three-letter summary code that corresponds to a series of occupations and educational areas that match the code. For example, a code of SAR would indicate that an individual scored highest on social, next highest on artistic, and third highest on realistic, and the jobs and educational areas would correspond accordingly. The SDS is second only to the SII in most commonly used interest assessment tool.

Another self-report assessment is the Harrington-O'Shea Career Decision-Making System (CDM) (Harrington & O'Shea, 1993). The CDM is an assessment of abilities, work values, and interests. Using a similar typology as Holland's, the CDM measures six career interest areas: crafts (R), social (S), science (I), business (E), the arts (A), and office operations (C). There are also several computerized assessments, including SIGI PLUS, published by Educational Testing Service, DISCOVER, and Careerhub. Vocational interest inventories can be used to assess academic interests as well. Most interest scales suggest educational options in addition to occupations. For instance, the academic comfort scale of the SCII (Campbell & Hansen, 1981) and the academic focus scale of the CISS assess interest, motivation, and self-confidence within academic endeavors. Also, existing scales contain subscales that measure academic interests. The Dimensions of Self-Concept Scale Form H (DOSC) (Michael, Smith, & Michael, 1989) assesses students' attitudes within the academic environment and includes a subscale for academic interest and satisfaction.

Researchers have also developed scales to measure specific aspects of the graduate environment. For instance, Kahn and Gelso (1997) developed the Research Training Environment Scale-Revised (RTES-R), a measure of attitudes toward research among students in counseling graduate programs. The scale's validity rests on its correlations with research interest, research self-efficacy, personality, and interest in practitioner activities. Kahn and Miller (2000) developed the RTES-R-S, a shortened form of the RTES, which demonstrated adequate internal consistency and corresponded closely to total scores from the original RTES-R.

Performance tests. Performance tests designed to measure abilities in various domains—such as SAT subjects test scores—are often combined with interest ratings obtained with self-report measures for an overall presentation of a student's interests (Prince & Heiser, 2000). While some tasks appear to be more performance-based, such as sorting out and prioritizing cards as in SIGI PLUS and TalentSort 2000 (Farren, 1998), they are closer to self-report.

Biographical data. Biographical data might serve as a proxy measure of interest in an area. For example, college major, the number of courses taken in a given area, and dissertation topic all reflect interests.

Predictors of interest. Among the predictors of interest are such factors as group, environmental, and personality.

Group factors. Gender has traditionally been a major determinant of interests (Gottfredson, 1996). Originally, separate interest inventories existed for men and women, each developed to accommodate areas such as housewife and nurse for women and engineer and businessman for men (D.P. Campbell, 1971), reflecting common response patterns. At the time of the revision of the Strong Interest Inventory in 1994, analyses revealed few important differences between men and women.

Some gender differences remain. Men score higher on the realistic scale on the CDM, for example, while women score higher on the social scale (McLean & Kaufman, 1995). Women prefer occupations in the social and artistic domains, while men prefer more hands-on occupations (Slyter, 2001). Some differences are subtler—in an analysis of male and female psychologists, women report interest in opera while men report interest in the symphony, two obviously related areas of interest (Harmon et al., 1994). An investigation of the interests of Midshipmen (undergraduate students) at the U.S. Naval Academy found women to score significantly higher than men on the Academic Interest and Satisfaction (AIAS) subscale of the DOSC-Form H (Paik & Michael, 2000). Thus, men and women do not differ on self-report interest measures to the extent that separate measures are necessary.

Researchers have found few differences in occupational interests across various ethnic groups (Fouad, Harmon, & Hansen, 1994; Holland, Fritsche, & Powell, 1994), and little is known about the stability of interests as a function of ethnicity (Harmon, 1999). However, some have found interesting within-group gender differences. In an analysis of interests of men and women who belong to different ethnic groups, Tomlinson and Evans-Hughes (1991), using the

Strong-Campbell Interest Inventory, found that men reported higher realistic interests (consistent with past research) than did women. However, while Hispanic and White women were more likely than men to report artistic interests, Black women were less likely than Black men to prefer artistic interests. Further, Black men scored higher on the academic comfort scale than did Black women, suggesting the men to be more comfortable and satisfied with their educational experience than were the women. Also, Black women reported a preference for working alone, while Black men showed a preference for working with people. Additional research on group differences is clearly needed. Tinsley (1994) has emphasized the need to develop reliable and valid assessments and utilize existing theoretical frameworks to understand the relationship between vocational assessment and ethnic identity.

 Environmental factors. Presumably, students who undertake graduate school have a considerable amount of interest in their chosen field. Such an interest was likely influenced by a variety of environmental factors. Specifically, interests often develop through interactions and identification with a mentor or role model within a particular area (Savickas, 1999). Decisions to undertake graduate school may have been influenced through interactions with undergraduate advisors and revered faculty members. Also, numerous studies demonstrate that prior success in a domain increases interest in that domain (Locke, 1965; Campbell & Hackett, 1986). Therefore, interest among graduate students was likely fueled by undergraduate success in their chosen area.

 Personality factors. Interests appear to map onto the same fundamental constructs believed to underlie personality. An investigation of the relationship between the interests as measured by the Self-Directed Search and the Big 5 personality factors revealed substantial correlations. Notably, extraversion correlated with enterprising and social interests, openness correlated with artistic and investigative interests, and conscientious correlated with conventional interests (Costa, McCrae, & Holland, 1984; Gottfredson, Jones, & Holland, 1993; McCrae & Costa, 1997). Considering creativity and interests, artistic interests showed the highest association with creativity, followed by investigative, social, and enterprising. As one might expect, realistic and conventional interests were least related to creativity (Helson, 1996; Holland, 1986). Holland (1999) argues that personality and interests overlap and differ only in the criteria that underlie them. Ackerman and Heggestad (1997) have proposed a system of trait complexes or clusters that combine interests, personality, and ability variables.

Other research has revealed the relationship between self-efficacy and interests. Lent, Brown, and Hackett (1994) propose that people develop interests within domains in which they feel efficacious, and thus, anticipate positive outcomes. Several studies lend support to this idea. For instance, vocational interest was one of the strongest predictors of academic self-efficacy for engineering/science undergraduates (Hackett et al., 1992), and research self-efficacy is positively correlated with interest in the scientist domain (Geisler, 1996). Among graduate students in counseling psychology, research self-efficacy was positively correlated with responses on the research training environment scale, a measure that can be used to assess interests in research (Phillips & Russell, 1994). In a related vein, students who believe intelligence to be a fixed entity (i.e., not malleable; for more on this, see the Motivation section) report a decline in interest in the relevant academic domain in response to any negative feedback (Dweck & Sorich, 1999). Presumably, assuming that intelligence is unalterable decreases self-efficacy, and consequently, interest in the relevant academic domain.

Self-efficacy scales are commonly used in conjunction with interest measures in vocational counseling settings. For instance, the Skills Confidence Inventory (SCI) (Betz , Borgen, & Harmon, 1996) measures self-efficacy with within each of the six Holland types. Further, the General Confidence Themes (GCT) consists of ten activities relevant to the Holland type. Respondents rate the extent to which they feel confident in their ability to complete the task. This provides interest/confidence patterns along the six personality areas and constitutes an important part of the overall strong profile.

Interests as predictor. Numerous studies have demonstrated the link between interests and important academic outcomes. For instance, among counseling doctoral students, interest in research predicted research productivity and science-related career goals (Kahn & Scott, 1997). Swanson and Hansen (1985) found the Academic Comfort Scale of the Strong Campbell Interest Inventory to correlate with GPA and attained educational level among undergraduates. Academic Comfort scores were positively related to educational goals and graduate school plans, and the SCII was substantially more predictive of college majors for students with high Academic Comfort scores than it is for students with low AC scores. In an analysis of counseling graduate students, Phillips and Russell (1994) found a positive correlation between perceptions of the research training environment (PRTE) and research productivity (RP) only among a subsample of advanced graduate students. Finally, in an analysis of Ph.D. level counseling psychologists,

Krebs, Smither, and Hurley (1991) investigated potential influences of interests on research productivity (using Holland's Vocational Preference Inventory, 1985, and the Research Training Environment Scale (Royalty, Gelso, Mallinckrodt, & Garrett, 1986). Investigative interests were positively related to research productivity, whereas social interests were negatively related to research productivity.

Other research has explored the link between interests and intelligence. Ackerman and Heggestad (1997) identified three of Holland's interest domains that relate to intelligence: realistic interests, investigative interests, and artistic interests. Their review found realistic and investigative interests to be most closely related to fluid intelligence and abilities such as mechanical knowledge. Artistic and investigative interests are correlated with crystallized intelligence and verbal ability. Kaufman and McLean (1998) found that the investigative and realistic themes on the SII were significantly related to IQ, and the basic interest scales of writing, nature, teaching, mathematics, and art were also significantly related to IQ. McLean and Kaufman (1995), however, showed no relationship between IQ and interests as measured by the CDM.

Social attitudes and values. For this review, social attitudes and values concern the most important and general values, beliefs, and attitudes that might reasonably be expected to affect success in higher education. Social attitudes and values may be distinguished from personality in several ways. One is that they include a valuation and valence component—whereas a personality statement is that "I enjoy being by myself," a values statement might be "I believe it is a good thing to spend time alone." They also are thought to be more modifiable than personality traits. Whereas an outgoing person tends to stay that way throughout his or her lifetime, we can and do change what we believe is important (e.g., happiness vs. success; material wealth vs. inner peace), as a result of our circumstances and interactions with others. Indeed studies of social attitudes and values are quite often studies of differences between cultures rather than individuals, under the presumption that culture which changes over time, and across borders, is manifested in social attitudes and values. Social attitudes and values are also more strongly associated with ideology than personality is (Saucier, 2003).

There have been several broad approaches to studying social attitudes and values. Saucier (2000) summarized what might be considered the psychometric approach, focusing on an individual's social attitudes and values. He concluded that much of social attitude research has been dominated by a few constructs—conservatism, authoritarianism, dogmatism, and

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religiousness. Further, he argued that a strong general factor even ran through these, suggesting there really may be only one major social attitude factor. Using a lexical approach (similar to that used in studying personality), he was able to identify four social attitude factors, which might be labeled religious orthodoxy, unmitigated self-interest, protection of civil status quo, and unorthodox spirituality (Saucier, 2003).

Focusing specifically on cultural rather than individual differences (typically differences between countries) is an alternative approach to studying social attitudes and values. Considering cultural differences, Schwartz (1992) proposed ten value dimensions: power, achievement, hedonism, stimulation, self-direction, universalism, benevolence, tradition, conformity, and security. The framework was later supported with a large-scale, cross-cultural study (Schwartz & Boehnke, 2003). Another approach was taken by Hofstede (2001), who administered a large values survey to workers (primarily IBM) in more than 50 countries. He identified five major dimensions: power distance (flat vs. hierarchical organization), uncertainty avoidance (conformity to rules), individualism, masculinity (competitive vs. relationship orientation), and long-term vs. short-term orientation. There are some obvious overlaps among the factors in these various schemes, but thus far no single study has attempted to link them.

Measurement of social attitudes and values. The three major instruments—Saucier's (2000), Schwartz's (1992), and Hofstede's (2001)—each present items to which the respondent indicates degree of endorsement on a Likert scale. Saucier's instrument is based on dictionary definitions of "ism" words, such as patriotism, creationism, pragmatism, and the like (dictionary definitions are used because many of the ism words are not known to examinees). For each, examinees indicate their endorsement on a five-point scale from strongly disagree to strongly agree. Hofstede's instrument is based interviews of IBM workers and existing surveys. It consisted of 160 to 183 items (depending on the form and language) asking a variety of questions about the workplace, such as how important (on a 1–5 scale) it was to "live in an area desirable to you and your family" and "have an opportunity for advancement to higher level jobs;" how satisfied "are you at present with 'the challenge of the work you do,' and 'your fringe benefits,'" and so on. Schwartz's instrument, the Schwarz Value Survey (SVS), consists of 57 items, each requiring a 9-point Likert scale response. Items are words followed by brief explanations (e.g., EQUALITY [equal opportunity for all]), and the Likert scale ranges are "opposed to my principles," "not important," and "of supreme importance."

Predictors of social attitudes and values. Saucier developed his scales to be orthogonal to personality. It is likely that there is some overlap between personality and the scales of Schwartz and Hofstede, but little research has been done to confirm this. There are major differences between countries with respect to social attitudes and beliefs, but summarizing these would go beyond the scope of this review.

Social attitudes and values as preditors. There is considerable research linking social attitudes and values to all kinds of social and economic indicators of the kind that are measured at the national level, such as literacy, GNP, and life expectancy. Little if any research, as known, has attempted to link the kinds of social attitudes and values reviewed in this section to specific educational outcomes varying across individuals within a society.

Prospects for applied use in admissions decisions. Attitudinal factors represent a rich source of student information that could be viable selection criteria for admissions committees. There are several problems with its use. First, most of the measures are self-report instruments. These would be subject to the problems of coachability and fakability that would plague personality measures used in admissions decisions. There were a few examples listed here that did not rely on self-reports. The CAVE method of analyzing attributional style might be applied to students' writings, for example, as a way of determining whether students possessed adaptive attribution patterns going into graduate school.

However, in addition to faking, there may be a couple of other considerations that would preclude acceptance of attitudinal measures in admissions. First, attitude may be rather malleable, perhaps more so than personality, and the quasi-cognitive factors. Thus, it might be appropriate to place more emphasis on attitude remediation and intervention strategies than on using attitude as a selection variable. Second, although attitude is certainly important, there may be less variance in attitude than in other noncognitive variables. It is likely that considerable self-selection will be involved—the applicant pool will likely consist of students who are closely identified with, interested in, and motivated to achieve within the domain. Attitudinal factors may not in fact be as valid as personality factors for graduate school admissions. It may be that attitudinal factors will have maximum value by serving the remediation needs of current students and also by informing applicants so that they may make advantageous application decisions.

Summary. Attitudinal factors relate to an array of important achievement outcomes and often stem from environmental and group factors. While these factors are discussed in this report

individually, ultimately they all share substantial motivational underpinnings, which link to performance outcomes. For instance, one who is highly identified with a domain will likely be motivated to perform well by the personal satisfaction derived from success in that domain. Similarly, high self-efficacy may motivate a person to persist at a task because the person believes there is a high likelihood that the effort will lead to positive consequences. Work on theories of intelligence highlights the relatedness of these constructs and their relevance to performance outcomes (Dweck & Sorich, 1999). Specifically, theories about intelligence relate to beliefs about one's self-efficacy and choices of motivational goals, which in turn influence effort and performance.

Others have proposed that self-esteem (the value attached to one's self-concept), self-efficacy, and locus of control, combined with emotional stability (a personality trait), comprise a higher order construct called core self-evaluations (Judge, Locke, & Durham, 1997). Core self-evaluations were found to be an excellent dispositional predictor of job satisfaction and job performance (Judge & Bono, 2001). Investigations on the link between such factors and higher education outcomes would be useful.

Attitudinal factors undoubtedly influence performance on the GRE and related graduate school success determinants such as effort and persistence. They likely also affect the relationship between the GRE and outcomes, that is, the test's predictive validity. For instance, one could have an adaptive attitude regarding graduate school, but a maladaptive one regarding the GRE (e.g., low motivation or low self-efficacy), which would affect the validity of the GRE. Or, as another example, students who are not identified with the relevant academic domain or who do not have a close match between their interests and their area of study may not succeed in graduate school despite high GRE scores. Even if there are problems with the measurement of attitudinal factors per se, it is nevertheless useful to understand these relationships.

This review suggests that graduate school persistence and performance is enhanced by awareness on the part of students, faculty, and admissions decision makers of these attitudinal factors. Future work is needed to determine the viability of assessing attitudinal factors for purposes of graduate student self-assessment for interventions, and perhaps graduate school admissions purposes.

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Environmental Influences on Graduate School Outcomes

A variety of environmental factors play important roles in graduate student outcomes both directly and indirectly through their effect on personality and self-views. The existing literature describes a wide array of factors ranging from prior academic experiences to social integration and financial support. These factors include mentor support, social support, encounters with academic stereotypes, institutional integration, nonacademic demands/influences, financial support, and prior accomplishments/academic experiences.

Mentor support. Students' interactions with faculty mentors can be a critical component of the graduate school experience. The quality of student/faculty interactions may affect student outcomes directly through learning opportunities and experience, and also indirectly through the student's orientation and integration into the academic environment.

Pascarella (1980) proposed a longitudinal model of academic persistence and institutional integration that emphasized the importance of informal contact with faculty. His model proposes that contact that transcends the scope of normal classroom activity fosters intellectual or interesting social dialogue, which ultimately motivates students. Conversely, the absence of such informal contact is believed to be the single most important predictor of attrition even after taking into account student background and personal and academic performance. Aspects of Pascarella's model have received empirical support (see Terenzini, Pascarella, & Blimling, 1999, for a full review). Moreover, in Lovitt's (2001) influential work on graduate student attrition, she found that both the nature and the quality of the advisor-advisee relationship to be a primary factor in the graduate experience.

Measurement of mentor support. The Ideal Mentor Scale (Rose, 2000) was designed to assess graduate students' definitions of the ideal mentor. Three underlying factors emerged through factor analysis: integrity, guidance, and relationship. Among Ph.D. students, Rose (2000) finds that nearly all respondents defined an ideal mentor as an experienced person who exhibits intellectual curiosity, reliability, research ethics, and good communication skills. They are available to the student, provide challenge and constructive criticism, and convey a belief in the student's capabilities. Bennett (2001) explored factors that constitute effective mentoring by comparing the outcomes and experiences of students who reported having a mentor with those who reported having an academic advisor. Presumably, a mentor relationship constituted a closer relationship than one characterized as an advisor.

Mentor support as a predictor. Lovitt (2001) found positive graduate experiences to be strongly related to advisors' productivity, academic and social engagement with the department, accessibility, and interest in students' academic and professional development. Moreover, a wide sampling of doctoral students found perceived mentor support to predict students' self-reported level of commitment to their chosen field (Uelkue-Steiner et al., 2000). Doctoral students in education programs who reported more positive and cooperative relationships with their advisors and committee members were more advanced in their dissertation writing (Faghihi, 1998). Similarly, among science and engineering graduate students, expectations about the quality of student/faculty interactions was a significant predictor of feelings of academic self-efficacy and expectations for career-related outcome expectations (Santiago & Einarson, 1998). In an analysis of institutional factors associated with persistence in doctoral programs, Stricker (1993) found that faculty accessibility, defined by the student to faculty ratio and department size, correlated with average time to completion of the doctorate degree among psychology students, but not among chemistry and English students. Thus, mentor support appears to relate to important graduate outcomes, but the type and magnitude of the relationship may vary across departments.

Mentor support may be particularly critical among students of color and women. Among Black undergraduates at PWIs, the number of Black faculty at the university is positively correlated with graduation rates (Steele, 1991). In an analysis of Black and Hispanic doctoral students, students who persisted to complete their degree were more likely to report having supportive major advisers (Clewell, 1987). Further, Black doctoral students who reported having had academic mentors reported greater mentor effectiveness and overall satisfaction with their doctoral programs than did students who reported having academic advisors, implying a more distant and formal relationship. Also, female mentors received higher effectiveness ratings than did male mentors from students (Bennett, 2001). A report from the American Council of Education identified faculty support, an atmosphere of expected success, faculty mentoring, and a critical mass of minority students and faculty as crucial factors in creating supportive environments to increase the participation and success of students of color in doctoral programs (Wagner, 1992).

In support of Pascarella's model among female students, the most significant positive effect on college persistence came from mentoring experiences in the form of nonclassroom interactions with faculty (Nora et al., 1996). Among 81 female graduate students over age 30

(nontraditional students), the quality of the student/faculty interactions was among the most important predictors of persistence (Hagedorn, 1999). In an analysis of graduate students of color, quality of teacher-student interactions and strong faculty support were among predictors of success for graduate students of color (Clewell & Ficklen, 1986).

Bandura's (1977) social learning theory can be extended to research on the student/mentor relationship. A review of the research has shown that students' educational outcomes improve when the faculty is comprised of others who share their group membership, and this effect may be due in part to students' vicarious learning processes. Specifically, students may learn optimal strategies for achievement by observing the behaviors of successful similar others. Clearly, a quality mentor relationship provides the student with guidance as well as support.

Social support. Access to supportive others has long been recognized as an important factor in health, emotional well-being, and achievement outcomes. Like mentor support, support from one's social group is generally viewed as an important factor in all aspects of the graduate student experience. Some graduate schools have attempted to form student cohorts in an effort to promote the retention of graduate students (Dorn & Papalewis, 1997).

Measurement of social support. Several scales are used to assess perceptions of social support. For instance, the Multidimensional Scale of Perceived Social Support (MSPSS) is commonly used to assess perceptions of social support from family, friends, and significant others (Zimet, Dahlem, Zimet, & Farley, 1988). It has proven to be a valid and reliable measure of social support among Black students (Canty-Mitchell & Zimet, 2000). Other scales have been developed specifically for use with college students. For instance, the Young Adult Social Support Inventory (Grochowski & McCubbin, 1984) assesses the social support systems available to college freshmen. Information on perceptions of supportive others and available campus resources is often collected via informal student surveys.

Social support as a predictor. Data from a survey of doctoral students from eight universities suggests that group cohesiveness and persistence to attaining the degree are significantly correlated (Dorn & Papalewis, 1997).

Among female graduate students over age 30, quality of student/student interactions was a primary predictor of persistence in addition to quality of student/faculty interactions (Hagedorn, 1999). In an analysis of graduate students in the 1970's, Black and Hispanic females consistently

reported lower academic self-concept than males, and the author attributed this to a graduate school racial-climate with low trust and little interaction among groups (Hurtado, 1994).

The report from the American Council of Education also recognized social support as one of the factors crucial to increasing the participation and success of Black, American Indian, Hispanic, and Asian American students in doctoral programs (Wagner, 1992). Similarly, in an analysis of noncognitive influences of academic success, access to a strong supportive system was a primary predictor of persistence among students of color (Tracey & Sedlacek, 1984).

Encounters with academic stereotypes and prejudice. Regardless of one's ethnicity, belonging to a group that is a minority on a college campus is related to feeling racially discriminated against. Among graduate students attending PWIs, Black and Hispanic doctoral students perceived substantially more racial discrimination than did White students (Nettles, 1990). Tan (1994) examined factors related to Asian American students' participation in higher education, their academic performance, and their experiences as college students when compared with students from other ethnic minority groups. While Asian American students had higher rates of academic participation and higher GPA's than did Black students, both groups reported facing many incidents of racism and prejudice, primarily from fellow students. Further, both groups expressed having had a lack of success in coping with these incidents.

Particularly problematic for women in mathematics and science fields and students of color is the experience of encountering negative stereotypes about their groups within the graduate academic domain. Stereotypes about intelligence are widely known, even among people who are targets of the stereotypes and who do not endorse them (Devine, 1989), and researchers have recently focused on the impact of these stereotypes on targets within the educational environment. A program of research has developed around the concept of stereotype threat, defined as a predicament in which a person fears verifying a negative stereotype about one's group (Steele, 1997). The threat arises in situations in which a stereotype about one's group is salient, and the group member becomes apprehensive about inadvertently confirming the stereotype. For instance, a female mathematics student might fear being evaluated according to the stereotype that women are not good at mathematics prior to an important mathematics exam.

Any person who is identified with the academic environment and who belongs to a group to which a stereotype about intelligence applies will be susceptible to stereotype threat. For instance, common perceptions that Asian American students are exceedingly capable at

quantitative tasks may introduce excessive pressure for these students (Tan, 1994). In contrast, Black and Hispanic students are often subjected to stereotypes that question their intellectual ability (Niemann, Jennings, Rozelle, & Baxter, 1994). As will be discussed, the experience of stereotype threat has been shown to suppress performance within important academic domains. Thus, stereotype threat has garnered attention in social psychological and educational research.

Measurement of encounters with academic stereotypes. Steele and Aronson (1995) administered an eight-item questionnaire designed to measure students' self-reported experiences with stereotype threat. Students reported their agreement to items such as "Some people feel I have less verbal ability because of my race," and "The experimenter expected me to do poorly because of my race." Also, often researchers simply ask students of color about their experiences with prejudice and discrimination. For instance, Brown (1997) asked students' level of agreement with statements including "Prejudice is still a major problem in the United States," "People in my group often face prejudice and discrimination," and "I have been treated negatively because of my ethnicity/race."

Academic stereotypes and prejudice as a predictors. Researchers have demonstrated that stereotype threat often leads a target to inadvertently confirm the stereotype the individual wished to avoid. For example, in one study, Black students who were told that they would be taking a test that measured their intellectual ability, thus priming the negative ethnic stereotype of low intellect, performed worse on a test in comparison with Black students who were told that the test was merely an analysis of the problem solving process (Steele & Aronson, 1995). Apparently, the mere introduction of a negative stereotype can hinder performance. As expected, Black students reported significantly more experience with stereotype threat than White students, as measured by a stereotype threat questionnaire.

Researchers have demonstrated the consequences of stereotype threat with a variety of populations. College-age women performed worse than men on a difficult mathematics test when told that the test revealed gender differences (Spencer, Steele, & Quinn, 1999). However, women who received no such information performed equal to men on the same test. Further, Asian American undergraduate students who encountered stereotypes about their superior intellectual ability were less able to concentrate and, as a consequence, performed poorly compared to students who were not reminded of the stereotype (Cheryan & Bodenhausen, 2000). Although people commonly hold positive stereotypes about Asian students' mathematical skills, making

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these stereotypes salient prior to performance can create the potential for "choking" under the pressure of high expectations.

Levy (1996) demonstrated that stereotype threat is not limited to stereotypes about gender and ethnicity. Elderly participants performed poorly on a memory and motor skills task only when reminded of negative stereotypes about the elderly such as dementia. Others have extended this work to social class (Croizet & Claire, 1998). The correlation between socioeconomic status and intellectual ability is often demonstrated and widely known (Neisser et al., 1996). Therefore, students from low socioeconomic backgrounds performed worse than other students on a test when it was described as diagnostic of intellectual ability. Collectively, these studies suggest that simply making a negative self-relevant stereotype salient within a setting that is relevant to that stereotype can hinder performance.

Although the causes of stereotype threat remain uncertain, research has suggested that perceptions of important evaluative audiences (i.e., mentors, instructors and test administrators) may be key (Walters et al., 2001). So expectations of being stereotyped when in an environment where a negative group stereotype is salient can have deleterious consequences. Prior research describes these perceptions as meta-stereotypes—one's beliefs about the stereotypes that others hold about one's group (Vorauer, Main, & O'Connell, 1998). This research has shown that meta-stereotypes can lead to a threat to self-concept (Vorauer, Main, & O'Connell, 1998). Other research has supported the notion that stereotype threat stems from social aspects of the testing environment. Inzlicht and Ben-Zeev (2000) found that test performance could vary with the social composition of the testing environment. Specifically, when taking a mathematics test with other students, the more male students that were present, the worse the female students performed.

Ultimately, chronic exposure to stereotype threat may lead a threatened student to disidentify from the academic domain (Steele, 1997). Specifically, students will come to detach their identity from the domain in which they feel devalued, and consequently be unable to perform adequately (Crocker & Major, 1989). While graduate students of color and female graduate students have most likely found ways to persist despite these circumstances, these factors may still contribute to higher attrition rates than White and male graduate students (National Center for Educational Statistics, 1995; Zwick, 1991).

However, researchers caution against misinterpreting stereotype threat findings and overgeneralizing the effect to actual testing and educational environments (Sackett et al., 2001). For instance, in one analysis within an operational testing setting, Stricker and Ward (1998) failed to find stereotype threat. Others question the conclusions drawn about stereotype threat, because research has not yet considered the role of voluntary and involuntary minority status in performance outcomes (Ogbu, 2001; Ogbu & Simons, 1998). Future research will need to investigate the generalizability of stereotype threat research.

Women and students of color must address a greater variety of circumstances beyond academic performance. In an analysis of noncognitive predictors of academic success, the ability to deal with racism significantly predicted success among students of color (Tracey & Sedlacek, 1984). Consistent findings that women at both graduate and undergraduate levels report that feelings of psychological alienation or depression played a critical role in their decisions to leave science/mathematics/engineering disciplines, and that despite good academic performances, they experience diminished self-esteem, self-confidence, and career ambitions (Hewitt & Seymour, 1997).

Institutional integration (academic and social). Perceptions of mentor and social support in addition to experiences with stereotypes influence the extent to which students feel socially and academically integrated into their university or graduate program. Academic and social integration into the institution may depend on a variety of factors such as the student's group membership, the majority ethnic and gender composition of the institution or program, in addition to general influences of social and mentor support.

Student integration is the key component of Tinto's (1975) well-known model of student retention. Tinto views retention and attrition in higher education as longitudinal processes that are a function of students' integration, or lack of, into the academic and social climates of the institution. He proposed that each student enters the institution with a unique set of background characteristics (beliefs, personal and family issues, academic characteristics and commitment, and dispositions) with respect to college attendance and goals. The student's level of social and academic integration is continually being modified with everyday exchanges with members of the academic and social systems of the college or university. Satisfying academic and social encounters lead to increased integration, thereby resulting in higher rates of retention.

Further, Lovitt (2001) highlighted the role of academic and socioemotional integration in graduate school persistence. Her work indicated that these factors serve as vehicles for access to vital information about the formal and informal expectations for degree attainment. This knowledge constitutes *cognitive maps,* which guide students through the necessary requirements of each phase of their programs. Survey and interview data revealed that nondegree completers experienced fewer opportunities for integration into the department community, and consequently, received little guidance, information, and support necessary to complete their programs.

Measurement of institutional integration. Institutional academic and social integration are often assessed through structured interviews with graduate students. However, in an effort to test Tinto's model and quantify these experiences, Pascarella and Terenzini (1983) created the Institutional Integration Scale (IIS) to measure students' academic and social integration into college. Academic integration is measured by the Academic Development Scale (alpha = .72) in conjunction with GPA, credits earned, and hours spent engaged in academic extracurricular activities (such as band, theatre, and professional organizations). Social integration is measured by the Peer Group Relations Scale (alpha = .84), the Informal Faculty Relations Scale (alpha = .83), as well as measures of residency, campus employment, hours spent engaged in social activities, and hours spent engaged in intercollegiate athletics.

Predictors of institutional integration. Tinto (1975) proposed that successful academic and social encounters lead to increased integration into the university environment, thereby resulting in higher rates of retention. Further, students' motivational orientations can influence these patterns of integration and attrition. For instance, among students who were motivated to attend college for practical, academic, or knowledge-seeking reasons, academic integration positively and directly influenced persistence (Stage, 1989).

An important factor in institutional integration is the predominant ethnicity at a university. For instance, Black students attending HBCUs present reported greater academic integration than did Black students attending other institutions (Robinson, 1990). They also had higher GPA's and graduation rates. In a longitudinal study of Black students, attendance at an HBCU led to significant increases in standardized measures of reading comprehension as well as self-reported measures of increased understanding of the arts, humanities, and science (Flowers

& Pascarella, 1999). Thus, integration and consequent academic success may depend in part on students' shared group identity with other students at the institution.

Although comprehensive programs and policies geared toward minority student retention have generally been successful (Clewell & Ficklen, 1986), some efforts by institutions to address the needs of underrepresented groups within graduate programs may have an adverse effect on integration. For instance, among women entering science, mathematics, and engineering majors, some reported that preferential hiring policies, scholarships which promote women's participation in science, and special programs to support women through SME majors added to the difficulties which they already faced in establishing male respect of their abilities (Hewitt & Seymour, 1997). Such women avoided any kind of special treatment, did not use women advisors or programs, and did not join women's professional societies. They preferred to cope with academic difficulties by distancing themselves from all sources of official help based on gender. Similarly, undergraduate students of color often avoid opportunities that might make their ethnic identity salient such as gifted programs designated for minority students (Fordham & Ogbu, 1986). These researchers suggest that these problems can be addressed effectively by reviewing student performance (both minority and nonminority) to determine where systemic underperformance exists, and then to take steps to address those areas.

However, it is important to note that several groups of students of color often persist and achieve despite underrepresentation of other group members at their institution and other sources of support. Again, future tests of models of institutional integration will need to consider the wide range of experiences that influence the needs of individual groups (Ogbu, 2001; Ogbu & Simons, 1998; Ogbu & Stern, 2001).

Institutional integration as a predictor. Lovitt's (2001) survey and interview data revealed that nondegree completers experienced fewer opportunities for integration into the department community, and consequently, received little guidance, information, and support necessary to complete their programs. In an investigation of students at 23 colleges and universities, a positive significant relationship was found between performance outcomes (including standardized test scores and self-reported performance gains) and peer interactions (including course-related and non-course-related activities occurring inside and outside classroom settings; Whitt, Edison, Pascarella, Nora, & Terenzini, 1999).

In support of Tinto's model of student retention, Wood (1995) found that social support among freshman influenced integration into the university and subsequent persistence through the second year. Further, Clewell (1987) found that participation in professional activities in graduate school differentiated persisters and nonpersisters among Black and Hispanic doctoral students.

Nonacademic demands/influences. Nonacademic demands and influences among graduate students describe a wide range of effects that may be beneficial and detrimental to academic performance outcomes.

Measurement of nonacademic demands/influences. Information about students' nonacademic commitments can be gathered by demographic questionnaires and structured interviews. The Multiple Role Conflict Scale (MRCS) measures psychological strain of handling multiple roles (Middlesworth, 1999). Although the scale was designed to assess the mental health correlates of women engaged in multiple roles, the scale could be modified for male and female graduate student populations.

Nonacademic demands/influences as a predictor. Multiple role conflict negatively related to academic self-efficacy among graduate students in education (Feldmann & Martinez-Pons, 1995). For minority students, family responsibilities and working off-campus were the strongest predictors of attrition (Nora et al., 1996). However, extracurricular activities can also have a beneficial role. Tracey and Sedlacek (1984) found community involvement to be a significant predictor of persistence among Black students.

Financial support. Graduate students may receive various forms of financial support from their institutions including, but not limited to, fellowships, teaching assistantships, and research assistantships.

Financial support is important. It promotes staying in doctoral programs (Attiyeh, 1999; Jacobson, 1992; Lovitt 2001), and leads to better dissertations (Faghihi, 1998). Raising tuition increases attrition (St. John & Andrieu, 1995).

A question is, what is the best kind of financial support—fellowships or assistantships? A survey by economist Ronald G. Ehrenberg at Cornell University found that doctoral students are more likely to complete their degrees, and in less time, if they receive fellowships rather than research or teaching assistantships (Jacobson, 1992). Lovitt (2001) found evidence to support the opposite—students with fellowships had higher rates of attrition than did students with research

and teaching assistantships. Lovitt posited that fellowships inhibit opportunities for academic and social integration because students have fewer on-campus obligations. In support of Lovitt's thesis was a study of former Ph.D. students from the University of Buffalo who reported that financial support with a service commitment led to a fuller graduate experience, as well as to shorter time to degree (Border & Barba, 1998).

Which is right? There is no obvious reason for the discrepancy; perhaps the best that can be done is simply to list the differences between the studies. Ehrenberg's sample included students in 4 departments across 25 years at Cornell, while Lovitt studied a single cohort of students from nine departments from one urban and one rural university. Lovitt's departments varied in their financial support practices, whereas Ehrenberg's departments were similar. Ehrenberg statistically controlled for gender, aptitude, citizenship, prior education, and starting salaries within each discipline, Lovitt did not. The question of whether unencumbered fellowships are more or less effective than service-committed assistantships is an important issue, but the differences between studies does not help here—not enough is known now to say which form of financial support is better.

Another question is whether assistance is equally accessible to all students. The answer seems to be no: Women in science and engineering graduate programs (Dix, 1987), graduate students in urban schools, and humanities students (Lovitt, 2001) are all less likely to find financial aid. It seems safe to assume that fellowships and assistantships would increase the participation and success of minorities in doctoral programs (Wagner, 1992). So it may seem surprising to find that Black and Hispanic graduate students with the highest attrition rates were also more likely than White and Asian American students to have received fellowships (Lovitt, 2001). Lovitt's explanation is that fellowships may be useful in recruiting students of color, but they may also diminish opportunities to integrate into the environment.

Prior accomplishments/academic experiences. The quality and type of students' prior experiences have an obvious impact on graduate school experiences and outcomes. Research has considered such factors as undergraduate and high school coursework, achievement test scores, as well as a wide range of service and internship opportunities.

Measurement of prior accomplishments/academic experience. Transcripts provide important information about the content and performances in prior coursework. Self-report measures often included in graduate applications (e.g., relevant coursework) can also yield prior

educational information. Baird (1979) created a prior accomplishments inventory for graduate school applicants that included literary and expressive, scientific and technical, artistic, and social service organizational activities (Baird and Knapp, 1981). Stricker (1983) created a documented accomplishments scale, designed to enable validation, that is organized into academic achievement, leadership, practical language, aesthetic expression, science, and mechanical domains.

Prior accomplishments/academic experiences as a predictor. Several studies have demonstrated the relationship between prior accomplishments and academic experiences and later academic success. Baird and Knapp (1981) found that pre-graduate school accomplishments predicted a host of graduate school accomplishments, although not graduate school grades. Similarly, participation in extra-curricular activities positively correlated with retention and graduation among undergraduates (Pascarella & Terenzini, 1991). In a comparison of students who did and did not graduate from undergraduate business-related programs, graduates were more likely to have participated in pre-career programs such as Future Business Leaders of America (Robinson, 1990).

Surprisingly, group differences have not been found on measures of accomplishment among GRE examinees (Stricker et al., 2001), with an exception of men reporting more mechanical accomplishments than women. High achievement as early as high school has been shown to predict persistence among Black and Hispanic doctoral students (Clewell, 1987). Still, inadequate preparation via coursework or prior experiences has been identified as a possible source of differences in graduate student success between men and women in the sciences (Dix, 1987). Self-efficacy, which may partly reflect differences in preparation, may also have an influence (Mulkey, 1997; Pajares & Miller, 1994).

Summary and Discussion

Several GRE studies conducted in the past several years have asked faculty about the qualities important to success in graduate school. A consistent finding is that graduate faculty believe that noncognitive factors, such as motivation, creativity, personality, interests, and attitude, ought to be considered in graduate admissions. Many faculty believe that including such factors would increase both fairness and the validity of the current admissions process. At the same time there is a lack of knowledge about what the scientific literature says on what the noncognitive factors are, how important they are, how they could best be measured, and on

whether it might be practical to use them in admissions decisions. The purpose of this review was to address these questions. This report identified various noncognitive factors and reviewed definitions, measures, correlates, and the validity of those measures.

We found it useful to divide noncognitive factors into predictor and criterion (i.e., outcome) groups, and to further divide noncognitive factors into several additional categories. The key predictor factors we evaluated were personality, attitudinal, and quasi-cognitive factors. To get a full picture, we also considered the role of various background factors—environmental factors, gender, and race.

Based on this review, we believe that there are four areas of potential application of noncognitive factors warranting consideration by the GRE: admissions, guidance, policies and interventions, and outcome evaluation.

Admissions

There are several advantages to including noncognitive factors in graduate admissions. One is to broaden the range of qualities considered. There are numerous reasons why students fail to complete graduate programs successfully, and only some reasons are strictly cognitive—it makes sense to consider important noncognitive qualities such as interests, motivation, ability to work with others, and willingness to work hard, in evaluating a candidate's potential for successful graduate study. Moreover, faculty have specifically stated in surveys and focus groups that they believe it is important to consider a wide range of such noncognitive factors in addition to cognitive ones in admissions decisions. Another advantage of including noncognitive factors is that gender and race differences on such factors tends to be much smaller than those observed for cognitive factors, and in many cases, differences are eliminated altogether. Adding such factors to those for which gender and race differences do exist will decrease overall score gaps and could lead to increased admissions of ethnic minority students and women in various academic programs. Such an expansion of variables considered in admissions therefore would be responsive both to validity and fairness goals.

There are also some problems in including noncognitive factors in graduate admissions. The primary problem is that currently, noncognitive factors of the type faculty often mention are most typically measured with self-reports. Self-reports are coachable and fakable. There are numerous methods designed to minimize faking, but these have never been evaluated in the context of a large-volume tests used in making high-stakes decisions such as the GRE. The

coaching industry would quickly crack the code on any noncognitive measure and translate that into a successful strategy for defeating the measure if it were a self-assessment.

Performance measures of noncognitive factors. There may be ways to get around this problem. One is through the development of a skills or performance measure (sometimes referred to as an objective, or objective-analytic measure in the personality literature). Many emotional intelligence measures, at least the ones that are not self assessments, may be considered skills or performance measures, and may be relatively resistant to coaching and faking. Such measures have not been validated against operational criteria yet; however, it seems reasonable that they could prove valid in some disciplines, such as clinical psychology, social work, nursing, and other disciplines involving interpersonal skills. Other performance measures, even less well developed, are the Implicit Association Test (IAT) (Greenwald & Benaji, 1995) and the conditional reasoning task (James, 1998). It is not known whether any of these could be developed for the noncognitive factors of interest in graduate admissions, whether they would be coachable, or whether they would be valid. But the approaches seem promising and warranting of further research and further consideration.

Standardized letters of recommendation and personal statements. Another approach is to build on the mechanisms already in place for transmitting noncognitive information to faculty. In the interviews, faculty said they obtained such information from letters of recommendation and personal statements. A major problem with these two mechanisms is that no one knows how successful they are in performing the task of communicating noncognitive information about the student to the admissions committee. Faculty like them and use them, but few if any large-scale systematic studies have been conducted on their actual validity. There are several ways this can be done:

1. Coding letters of recommendation with respect to various noncognitive dimensions (e.g., general personality factors, motivation factors) and conduct validity studies from the coded information

2. Creating standardized letters and have faculty complete such evaluations of students (a letter of recommendation) or have students complete such an evaluation (a personal statement). In the case of the latter, it might be useful to have a second party (such as a faculty advisor) review the student's personal statement to avoid the self-assessment bias that is possible in all noncognitive self-assessments.

Guidance

There are guidance systems, such as SIGI PLUS from ETS, that use noncognitive variables such as the ones discussed in this review. The most popular are interest inventories, and many guidance systems are designed to match a student's or an applicant's interests with the requirements of a job or field of study. No guidance system has attempted to match the full range of noncognitive variables—personality, attitudinal, and quasi-cognitive factors, along with background variables—with the requirements or characteristics of graduate schools, departments, or disciplines. However, it might be useful to think about the value of such a system, and how it could be implemented. Suppose one could measure a large number of noncognitive variables on graduate students in particular programs, departments, schools, and disciplines, in an effort to develop a profile of what such students are like. One could then measure the same variables on applicants, who then could be presented with feedback on their own profiles and a presentation of the profiles of various programs to which they are considering applying. This could be useful information in selecting degree programs. One could also conduct follow-up studies to evaluate whether student/department profile matches lead to better graduate school outcomes.

Policies and Interventions

This review suggests that institutional policies and interventions be designed to increase graduate school outcomes, particularly for certain groups, such as ethnic minorities, or women in mathematics, science, and engineering programs. This review specifically included discussion of race and gender mediation effects on graduate school outcomes for all the noncognitive factors. Further review of some of these findings may provide some suggestions on where additional support policies, and additional interventions might productively be developed.

Outcomes

In the interviews and focus groups reviewed here, faculty identified the importance of the various noncognitive factors not only for admissions purposes, but also as an outcome of graduate study. For example, faculty mentioned the importance of developing qualities such as persistence, collegiality, independence, creativity, enthusiasm, and good values as part of the graduate school experience. One of the purposes of the review was to define these qualities that faculty mentioned more precisely; to assemble the research literature on these qualities, and to

note their precedents, antecedents, and correlates. Having done so, it should now be possible to assemble a taxonomy of such factors, along with methods for adequately measuring them. Such a resulting battery of measures could serve as a guide for a comprehensive noncognitive outcomes assessment, which could be administered to graduate students perhaps at the beginning and end of graduate school. Comparing scores from these two time points could inform graduate faculty and graduate schools about the effect of their graduate programs on these less tangible noncognitive factors. Or profiles of students who leave could be compared with students who completeg the degree in studies of the causes of attrition. All these would be low-stakes applications, and therefore it would be possible to use the self-assessment instruments without the same fear of measurement bias that would threaten admissions applications. Institutions could conduct longitudinal studies of such factors for internal or promotional purposes to illustrate a range of outcomes for students of their programs, thus going beyond the knowledge and skills mastery outcomes normally touted.

Summary

The purpose of this review was to consider how the graduate education community could use noncognitive constructs and measures. It is important to start by considering what noncognitive factors faculty and those involved in graduate admissions value, both in admissions and as program outcomes. Fortunately, there have been a couple of recent studies of these factors that provide the beginnings of a good sense for what those qualities are, and a useful framework from which to interpret findings from those studies. The world of noncognitive variables is large, but it is manageable. Significant strides have been made in our understanding of the space of noncognitive variables, to the point where it is now productive to begin validating those variables with respect to graduate school outcomes, rather than continue exploring that space, per se. There are certainly varied categories of noncognitive variables—from group and environmental variables to personality. Considering these together, as attempted in this review, is important for theorizing about how noncognitive variables affect graduate school outcomes.

Finally, there are specific opportunities in noncognitive assessment for graduate education that could be pursued immediately. For the most part, doing something like administering a personality inventory as a potential supplement to the GRE-V and Q is probably not a realistic possibility given the threat of coaching and fakeability. But there are a number of other ways in which noncognitive variables might be used—in admissions, guidance, policy, and

outcomes assessment. In admissions, one can imagine using noncognitive variables in the creation of a guide for writing or interpreting letters of recommendation or personal statements. In guidance, there is a possibility of using noncognitive information to help students find compatible graduate study programs. Policy recommendations and interventions could be developed based on relationships identified here between noncognitive factors and graduate school outcomes. Outcomes might be expanded, and institutional studies conducted, based on the inclusion of a wide range of noncognitive outcome variables in comparisons of beginning and finishing graduate students, or those who leave and those who stay.

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Notes

[1] That is, adding extroversion and agreeableness scores, and subtracting conscientiousness scores would yield a score highly positively correlated with Snyder's self-monitoring score. In other words, high self-monitors are those high on extroversion and agreeableness, and low on conscientiousness. The authoritarian personality is associated with being high on conscientiousness, and low on agreeableness and openness.

[2] Eysenck (1991) turned this argument around by asserting that conscientiousness and agreeableness were (atheoretical) facets of psychoticism.

[3] This comprehensive list was assembled by Kamp & Hough (1988) in their classification of personality dimensions for the US Army's Project A (Campbell, 1990).

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