Beyond Traditional Assessment: The Influence of Noncognitive Attributes on the Clinical Performance of PA Students

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Abstract

The stark contrast between classroom and clinical learning environments can be a challenging hurtle of some physician assistant/associate students to overcome. While traditional cognitive assessments are generally helpful for identifying students at risk for experiencing academic challenges in clinical learning environments, some students exhibit poor clinical performance without warning. This causes emotional distress for the student and necessitates unanticipated and time consuming faculty intervention to identify the problem and provide customized remediation. It also highlights a potential gap in didactic instructional design. Building from the framework of Sternberg's Theory of Successful Intelligence (1997), a different approach to didactic PA student assessment can be imagined, one that reconsiders how PA educators not only assess students, but how they predict the ability of students to practically apply classroom curricula at the bedside.

Keywords

noncognitive attributes, trait-emotional intelligence, clinical reasoning, PA students

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Introduction

Why are some health science students proficient in the classroom but inept in the clinical setting? This question has long plagued healthcare educators yet remains unanswered. The need to understand why this occurs and how it can be recognized before a student enters the clinical setting remains an urgent unmet need in healthcare education.

The Accreditation Review Commission on Education for the Physician Assistant/Associate (ARC-PA) requires physician assistant/associate (PA) programs to provide comprehensive didactic and clinical medical training that enables its graduates to deliver high quality, patient-centered healthcare in a variety of settings and for patients across the lifespan. Such training consists of didactic and clinical assessments that test a student's medical knowledge and its application (ARC-PA, n.d.).

Clinical reasoning refers to the complex thought process that combines medical science with diverse patient data and diagnostic hypotheses (Kassirer and Kopelman in Ng, et. al., 2025). Clinical reasoning must consider the complex tradeoffs between the benefits and risks of tests and treatments as they apply to the individual patient to develop a comprehensive care plan. It is, perhaps, the central profession-specific skillset which healthcare providers offer their patients. Because of the high-risk nature of PA students' future work, it is especially important for PA educators to recognize student deficiencies early in the learning process so that timely, tailored intervention can be provided in hopes of preventing future medical errors.

Assessments, whether written or practical, are designed to help faculty identify struggling learners and their deficiencies so that individualized remediation exercises can be created and facilitated. Deficient concepts are then reassessed to ensure student proficiency. When both students and faculty are maximizing their efforts, it is discouraging to both parties when the process fails to identify a struggling student, resulting in that student falling short of the necessary clinical competencies, scoring poorly on summative examinations, or failing the Physician Assistant National Certifying Exam (PANCE). Standard written and practical examinations alone fail to identify all PA students who will struggle to excel on clinical rotations and later pass PANCE. PA educators need additional early prognostic indicators to identify students who are at risk for poor clinical performance so that deficiency-focused, proactive enrichment can be provided.

Over the past 15 years, conversation in healthcare education has turned to the realm of noncognitive attributes, or soft skills, to understand how students of different cognitive abilities develop clinical reasoning skills. Could measurement of a student's noncognitive attributes be the key missing piece to assessment practices in healthcare education programs? Further, could education that fosters the development of the most favorable noncognitive attributes for healthcare providers help students develop the clinical reasoning skills they may not otherwise acquire before graduation?

This paper examines the existing prognostic indicators for PA student academic achievement, identifying gaps in not only the existing literature, but also in the collective approach to predicting the clinical success of a PA student. From the viewpoints of students, faculty, and instructional design, established theories are presented to weave a multidimensional thematic analysis of the existing literature with the goal of considering a more holistic approach to

predicting PA student clinical outcomes, one that utilizes measurements of both cognitive and noncognitive attributes to predict a PA student's clinical performance.

The potential ethical implications of framing a portion of a student's education around a prediction of their future performance are also considered. From these findings, a series of policy recommendations are offered to approach the institution of novel pedagogy to instruct PA students, assess their performances, and provide individualized enrichment. Although noncognitive attributes may be of strong theoretical value, the applied study of them has been plagued by inconsistency in definitions and methods, as well as a lack of theoretical framework from which to build research relevant to healthcare education. Using Sternberg's Theory of Successful Intelligence (1997) along with Petrides' and Furnham's Theory of Trait Intelligence (2001), this paper will propose a means of operationalizing noncognitive attributes from which a novel empirical assessment of clinical reasoning in PA students can be developed.

Literature Review

To appreciate the importance of identifying and addressing the incongruence in didactic and clinical performance seen in some PA students, a PA's job role and scope of practice should be considered. PAs are licensed medical professionals who provide team-based medical care in all healthcare settings in the United States. While scope of practice slightly varies among states and US territories, PAs generally take medical histories and perform physical examinations, diagnose and treat illnesses, prescribe medications, order and interpret medical tests, assist in surgery, and provide patient education (AAPA, 2026).

PA training consists of a master's degree program averaging 27 months, or three academic years, pursued after obtaining a bachelor's degree and prerequisite science undergraduate coursework (AAPA, 2026). There is a minority of programs that offer an accelerated option, where students enter a pre-PA bachelor program and complete their master's degree in PA Studies over the course of five years.

Programs have didactic (year one) and clinical (year two) learning components, with students averaging over 2,000 hours of clinical experiential learning at the time of graduation (AAPA, 2026). Students are assessed with written and practical examinations during the didactic phase, while clinical phase assessments consist of written clinical preceptor evaluations, comprehensive discipline-specific written examinations at the conclusion of each specialty rotation, and other program-specific written and practical assessments. While students use simulated patient care situations during the didactic phase of PA education, it is in the clinical year that students apply that information to clinically reason for real patients in real medical settings.

PA education is modeled on medical school curriculum, providing instruction in all areas of medicine, leaving its graduates prepared to provide medical care in a wide variety of settings. In preparation for this training, PA student candidates complete an average of 3,000 hours of direct patient care experience in a wide variety of roles, including medical assistant, athletic trainer, emergency medical technician, and pharmacy technician (AAPA, 2026).

As of 2022, approximately 23% of PAs reported practicing in medically underserved areas, underscoring the critical role PAs play in making medical care accessible to the nation's population (Bruza-Augatis, et al., 2024). While PA students complete an extensive clinical phase of training consisting of clerkships in inpatient and outpatient environments over a wide variety of medical and surgical specialties that address both acute and chronic care, they are not required to complete a post graduate residency or fellowship. Thus, new graduates must be prepared to confidently make medical decisions from the onset of their careers.

Predicting PA Student Success

There is a breadth of research examining what factors may help predict PA students' academic achievement, most of which concern predicting PANCE performance. Such investigations have appeared in published literature for over two decades. Studies have examined a wide array of student demographics and cognitive assessments in search of a reliable means of predicting student performance. In addition to PANCE performance, there are a minority of studies with other primary objectives, including predicting a student's End of Rotation (EOR) exam scores, grade point average (GPA), and student attrition. There are also more qualitative works that ascertain students' perceptions of clinical preparedness.

Predicting PANCE Performance

PACKRAT. Much attention has been given to the Physician Assistant Clinical Knowledge Rating and Assessment Tool (PACKRAT®) when considering factors that help predict PANCE performance. PACKRAT is a 225-item multiple choice examination developed and maintained by the PA Education Association (PAEA) to comprehensively gauge student proficiency in core medical knowledge and principles of medical practice at a depth and breadth expected of an entry-level PA (PAEA, 2026). PA students typically take the exam twice during their training programs, and PAEA provides the mean and standard deviation of scores grouped by students who have greater than 10 months until graduation and those who are less than 10 months away from graduation. Some programs refer to these cohorts as PACKRAT 1 and PACKRAT 2 respectively.

PACKRAT is a self-assessment tool that allows training programs to determine their own testing conditions. Programs can choose to administer the exam with or without a proctor, the use of medical references, or a time limit (PAEA, 2026). Despite this variability, PAEA statistics have shown no significant changes in student scores when considering these variables. While PACKRAT content is regularly revised to accurately reflect the evolving PANCE blueprint, the PAEA falls short of declaring the exam to be a predictor of PANCE performance. Further, the PAEA states that PACKRAT should not be used as a test grade nor a summative examination (PAEA, 2026). It does, however, support the use of PACKRAT in assisting PA programs in assessing the effectiveness of their curriculum.

Most literature considering PACKRAT as a PANCE predictor examines PACKRAT scores in conjunction with other potential prognostic factors. In early work, Ennulat, Garrubba, & DeLong (2011) appreciated a predictive value for low PANCE scores when considering PACKRAT performance in combination with a student's summative examination score and the average scores of multiple choice exams given during didactic year of the program. Honda and

colleagues (2019) concluded with moderate to strong predictability that the best prognostic indicator for PANCE performance was a composite score of PACKRAT 1 and 2. They noted that for every 10 point increase in composite score, there was a 22 point increase in PANCE score. Similarly, a stepwise regression analysis with forward selection by Massey, et al. (2022) showed PACKRAT 1 and PACKRAT 2 to be the two statistically significant predictors left in the model at the conclusion of the analysis. PACKRAT 2 had a slightly better individual predictive value compared to PACKRAT 1.

There is evidence that providing remediation based on PACKRAT 2 scores may improve cohort PANCE pass rates. A single-program, 10 year analysis in which students with a PACKRAT 2 score of 145 or less received remediation saw program PANCE pass rates rise from 92.1% to 100% (Stream, 2022). This important work speaks to the power remediation has to maximize performance in selected students.

Other variables. In addition to PACKRAT, Massey, et al. (2022) also found positive PANCE predictive value in the PAEA-authored End of Curriculum exam, although these findings need to be considered within the confines of the study's small population size of 27 students. A multi-institutional study by Collett et al. (2022) identified a significant regression equation for predicting PANCE score using a student's Clinical Medicine II didactic course grade, PACKRAT 1 and 2 scores, and PAEA End of Rotation exam scores in Family Medicine and Internal Medicine. Lolar, Nadwana, and Maher (2023) likewise found a positive predictive value between End of Rotation exam grades and PANCE scores.

Prior healthcare experience and proficiency of authoring patient medical record documents have failed to show strong predictive value for PANCE performance (Lolar, Nadwana, & Maher, 2023; Butina, et al., 2017; Lolar, McQueen, & Maher, 2020). However, Lolar, McQueen, and

Meyer (2020) did note a correlation between simulated history and physical (H&P) exam documentation assignment grades and PANCE scores. Massey and colleagues (2022) found no predictive value for PANCE in a student's Objective Structured Clinical Examinations (OSCE) performance. Butina et al. (2017) concluded that grades from foundational coursework were the strongest predictors for PANCE performance when considering data available early in a student's PA education.

Certain metrics measuring a student's undergraduate performance have proven helpful, but limited, in determining PANCE performance. A 2019 literature review by Moore and colleagues discusses the weakly positive correlations of verbal Graduate Record Examination (GRE) scores, undergraduate grade point average (GPA), and having completed a variety of undergraduate science courses with PANCE pass rates. While Lolar, McQueen, and Maher (2020) found no correlation between the GRE component (verbal, quantitative, and analytical writing) scores and PANCE performance, they did note the positive predictive value of undergraduate GPA.

Traditional assessment modalities like PACKRAT and End of Curriculum exams have been found to have some positive predictability for PANCE scores, but authors unanimously recognize the need for more accurate means of predicting a student's PANCE performance. Researchers consistently recommend further research into additional parameters to incorporate into a performance assessment to better anticipate a student's PANCE performance (Honda et al., 2019; Stream, 2022; Massey et al., 2022; Collett, et al., 2022).

Predicting Performance as a PA Student

There is less data examining what predicts academic performance during a PA program. A variety of pre-program metrics and early didactic data have been examined as potential clinical

year performance prognosticators. Wolf, Schmidt, and Winter (2020) noted higher attrition rates among students who entered the program with lower cumulative and science GPAs and fewer pre-program patient contact hours. Multiple studies failed to predict EOR grades based on the degree of medical decision making of a student's pre-PA healthcare experience (Lolar, Pilat, & Welch, 2020; Lolar, Nandwana, & Maher, 2023).

While skill with H&P documentation was not predictive of PANCE score, it has been positively related to academic performance in the form of didactic and clinical GPAs (Lolar, McQueen, & Maher, 2020). Lolar, Nandwana, and Maher (2023) found no significant relationship between the level of decision-making required in students' healthcare experiences prior to PA education and their End of Rotation (EOR) examination grades in the clinical year.

The authors, however, questioned how prior health care experiences may have a role in the development of noncognitive qualities in PA students. Noncognitive qualities, also known as noncognitive attributes, or soft skills, are essentially personality traits, although depending on the theoretical basis under which one considers them, they may assume more detailed definitions (Björklund-Young, 2016).

Student Perceptions of Clinical Practice Readiness

Carter and Stoehr (2019) examined PA students' own personal perceptions of preparedness for clinical practice. Student participants noted confidence in the ability to function in the role of a healthcare team member but reported concerns pharmacotherapeutics and medical emergencies as topics they felt least prepared to undertake as medical providers. They cited a combination of didactic lecture, standardized patient simulations, case group study, and interprofessional learning events as their preferred methods of learning.

Bell, et al. (2022) conducted a multi-institutional study to gauge the PA student perceptions of simulated emergency case scenarios. Their intent was to understand how emergency simulation can affect a PA student's perception of readiness to care for multiple patients at a time. Utilizing pre and post event testing, investigators found that students perceived increased readiness to assess and care for multiple patients in an emergency department environment after participating in simulated scenarios. They also found that the activities increased student interest in pursuing a career in an acute care environment upon graduation.

Predicting student success in other healthcare provider programs

Other healthcare providers, including allopathic and osteopathic physicians as well as advanced practice registered nurses, each have their own board certification examinations with preliminary testing to ensure students are properly prepared to sit for exams. Looking at the work done in predicting their outcomes may provide insight into novel approaches to assess PA students.

In the first systematic review examining the potential causes of academic failure in didactic medical students, Ahmady, et al. (2019) reviewed 89 studies considering a wide variety of parameters, from student test scores to lifestyle habits, as well as elements of curricular design, all attempting to appreciate a correlation with student success in the classroom. They considered these findings from the perspectives of the student, faculty, and what was referred to as the 'system', which encompassed admission tests, learning environment, curriculum planning, and the pre-matriculation program (Ahmady, et al., 2019).

While academics in the form of grades certainly factored into medical student success, a student's attitudes and practices, including motivation, study strategy, various aspects of self-care practices, coping strategies, and personality traits were also found to be potential predictors of

student success in the clinical phase of training (Ahmady, et al., 2019). From the perspective of faculty, the expectations that instructors bring to teaching medical students may cause or at least influence student performance. A student-centered teaching style that employs active learning was underscored as a key contributor to student success.

From the standpoint of curricular design or the 'system', didactic learning with limited active problem solving and little dynamic classroom exchange presented a potential barrier to the development of clinical reasoning skills, although the authors strongly encouraged more empirical research of this phenomenon. A longer curriculum and a modular-subject structure in the didactic years were associated with better academic outcomes and lower attrition rates (Ahmady, et al., 2019).

The study of student success in the advanced practice nursing profession is well established, but the results vary. A 2017 retrospective study examining the academic files of 150 nurse practitioner students found significant relationships between GRE scores (both quantitative and verbal components as well as total score) and program progression and completion (Richard-Eaglin, 2017). There were also significant correlations between program-specific criteria including the type of admission status and history of a change in program concentration and program progression and completion. Using student exit surveys, Li and colleagues (2021) found significant relationships between both race and a student's prior nursing experience and their self-reported learning outcomes, while age and sex had no association with reported learning outcomes. In contrast, Knestrick, et al. (2016) noted that enrolled students over the age of 40 had nearly twice the likelihood of leaving the program compared to their younger counterparts.

El-Banna, et al. (2015) found no relationship between the years of student experience working as a registered nurse any of the following: GPA, clinical course GPA, history of failing a

course, and history of probation within the training program. Likewise, in a single center study, Niemczyk, et al. (2018) saw no correlation of prior work or education experience with the successful completion of a midwifery program.

Predicting healthcare student success from noncognitive attributes

Noncognitive attributes, also known as nonacademic qualities or soft skills, present an additional opportunity for educators to assess a healthcare student's probability of success. The relationship between noncognitive attributes and healthcare student abilities has been considered in multiple healthcare discipline students, including, although to a lesser degree, PA students.

In their 2021 literature review, Suciu, Melit, and Mărginean consider the central role that certain personality traits play in the ability to successfully carry out the duties of a physician. Their work explores the personality traits and characteristics sought in medical providers and presents approaches to categorizing those factors and even quantifying them. The authors consider the Neo Personality Inventory Revised (NEO-PI-R) and the nomenclature of its 'Big Five Model' as a tool for assessing the qualities behind the personality traits of openness, extraversion, conscientiousness, agreeability, and neuroticism (Vassend & Skrondal, 2011 as cited in Suciu, et al., 2021). They also consider the concept of emotional intelligence.

Emotional Intelligence

Emotional intelligence (EI), also known as 'emotional intelligence quotient' (EQ) is generally defined as the ability to recognize, understand, and manage not only your own emotions, but also the emotions of those around you (Landry, 2019). The study of EI is a relatively new area of research. The term was first used in German literature in 1966, but it wasn't until the 1990s that EI became a colloquial term in social science literature (Bowen, 2019). In the decades since, EI

has become the subject of innumerable publications, seminars, and methods. Several ideas and behaviors have been proposed as components to EI, however there is no one universally accepted set of criteria to define it or exclusive instrument to measure it.

EI may be more specifically defined within each of three accepted theoretical models- Ability EI, Mixed EI, and Trait EI. In 1990, Ability EI was born from the work of Salovey and Mayer, who defined EI as an ability to monitor emotions- both your own and that of those around you- and to discriminate how to use that information as guide for thinking and managing that information (Bowen, 2019). This definition highlights EI as a skill, or an ability, as its name implies. Goleman's work throughout the late 1990s and early 2000s identified and defined Mixed EI as an ability to understand and manage emotions that exist because of certain personality traits, namely self-awareness, confidence, self-regulation, conscientiousness, and motivation (Northouse, 2022). While the list of traits has undergone revision over the years, the theme of personal and social awareness remains the same. In 2001, Petrides and Furnham moved to bring more clarity to EI as a group of emotional perceptions or behaviors associated with personality (Bowen, 2019).

Measurement of EI is based on the theoretical subtype. Ability EI is measured through so-called maximal performance tests, which are lengthy and can be complicated, requiring participants to read scenarios involving emotions and choose their preferred course of action (Bowen, 2019; Bru-Luna, et al., 2021). The advantage of these assessments lies in their objectivity as participants are graded by researchers. Trait-EI measurement is based on self-reported perceptions of emotional processing (Bowen, 2019). While several trait-EI surveys have been developed over the past 25 years, perhaps the most well-known instrument is the Trait Emotional

Intelligence Questionnaire (TEIQue) form. Petrides and Furnham (2001) named 15 facets, 4 factors, and global trait EI as the components of TEIQue (see table 1).

TEIQue was initially introduced as part of Petrides' doctoral dissertation in 1998 and later evolved into a 153 question form that has been translated into over fifteen languages (Petrides, 2009). While the self-reported format of trait EI instruments raises concern for potential bias in their result, it is important to know that trait EI is considered a better measurement of an individual's behavior on a typical day, rather than when one is exerting maximum performance, as measured in Ability EI (O'Connor, et al., 2019). TEIQue has since been further tailored to accommodate specific age groups and abbreviated into a 30-question short form (TEIQue-sf) to increase its utility across different populations and settings.

Table 1.

The Domain of Trait Emotional Intelligence

Factor	**Facet**
Well-Being	Happiness Optimism Self-Esteem
Self-Control	Emotion Regulation Impulse Control Stress Management
Emotionality	Empathy Emotion Perception Emotion Expression Relationships
Sociability	Emotion Management Assertiveness Social Awareness
	Motivation
	Adaptability

EI as a prognostic indicator in health science students. EI has been studied for a possible correlation with multiple objective markers for student success in several fields of the health sciences, including medical, dental, and nursing students (Singh et al., 2020; Hsu et al., 2020) with positive correlations seen in both medical and dental students.

EI has been investigated as a potential predictor of academic performance on standardized testing, with positive predictive value for summative program assessments in junior doctors in Australia (Carr et al., 2018) and modestly positive predictive value of clinical skills as demonstrated in student doctors during Objective Standardized Medical Encounter (OSCE)-like testing (Stratton, et al., (2005). Likewise, Opsahl (2018) found a positive correlation between EI and board examination pass rates in registered nursing students.

A scoping review by Toriello et al. (2021) notes that while dozens of papers have been published considering EI in healthcare students suggesting a correlation between higher EI and superior clinical reasoning skills, most studies are limited in applicability to a broader audience by lack of longitudinal study, discrepancy in EI definitions and subtypes, and the heterogeneity of student training program types. The authors called for standardization of the EI definition, populations studied, and the approach to EI measurement in medical training programs to better understand the larger scale implications of these earlier findings.

There is a paucity of research examining EI in PA students. Canales and Cleveland (2015) suggested that PA school curricula that helps foster EI may help students develop better skill sets associated with it but felt that PA student-specific studies were first needed to determine the unique needs of this population before making any curricular changes. In 2018, Brenneman and colleagues published a paper in the Journal of Physician Assistant Education exploring a discussion in the PA education community about the association of certain noncognitive attributes with success in

healthcare. Two years prior, there was a consensus at the Physician Assistant Education Association Stakeholder Summit that PA employers report certain personality and behavioral attributes to be lacking in some new graduates. The authors concluded that it would be advantageous for PA programs to consider developing strategies to screen for and select those candidates who possess these desired qualities.

Cleveland, Canales, and Carr (2021) conducted the first proactive study to examine EI in PA students. A survey created by the authors consisting of 33 questions regarding EI was administered to a sample of 68 first year PA students at the start of didactic year as a pretest and at the end of didactic year as a post test. Researchers found that students with more than one healthcare experience prior to matriculating into the program had significantly higher emotional intelligence on the pretest. There are no studies to date examining the potential predictive value of EI for academic achievement in PA students when examined either alone or in combination with other known or potential predictors.

Analysis

In reviewing the body of literature examining factors key in the transition from PA student to clinician, several themes emerge: the prevalence of literature examining the prediction of PANCE performance, the examination of noncognitive attributes as potential predictors of success, and the emergence of trait emotional intelligence as a teachable, measurable, noncognitive attribute to predict student success. These themes help package the breadth and depth of knowledge of the subject to date, while simultaneously exposing the gaps present.

These themes will now be considered from the perspectives of students, faculty, and that of instructional design. A discussion of themes and viewpoints is best approached within the frameworks of existing theories which, in turn, can be woven together to better understand the issue as a layered and evolving problem.

The prevalence of literature examining the prediction of PANCE performance

The primary objective of most literature examining PA student academic achievement is forecasting PANCE performance. With over a century of data validating the use of cognitive testing in assessing intelligence (Ackerman & Kanfer, 2025), it comes as no surprise that PACKRAT- a standardized medical exam- has become the most valuable tool to predict PANCE.

Spearman's Theory of Intelligence (1904) considers intelligence as a composite of general intelligence (g) and specific abilities (s), two entities that collaborate to find meaning in confusion and recall that meaning later (Greenwood, 2015). While many theories have elaborated, extrapolated, and even contradicted Spearman, his theory continues to serve as a foundation of assessment, including that of PA programs.

Although several studies have proved the positive predictive value of PACKRAT and to a lesser degree, End of Curriculum, End of Rotation, and OSCE exams, not all students who perform well on these assessments pass PANCE on the first attempt. This contradicts the concept of 'positive manifold', the principle that recognizes the high correlation of cognitive assessments with one another (Borg, 2018). These exceptions can result in a false sense of confidence in both students and faculty that students are properly prepared to excel on a high stakes exam, and often presumably, in clinical practice. Despite PACKRAT 2's positive predictive value for PANCE performance, its proximity to program completion limits the amount of time available for student, faculty, and curricular course corrections should the scores be low.

If traditional assessments fail to detect student deficiencies, how then could students and faculty even know deficiencies exist? The need for more reliable objective parameters to predict poor performance earlier in PA training is well-recognized. Use of earlier prognostic markers would give the opportunity for students to self-reflect and revise their study habits. It would also give faculty the opportunity to provide individual and group interventions depending on individual and cohort performances. In addition, a better understanding of early prognostic indicators for PA student success opens the door to curricular innovation.

Howard Gardner's Theory of Multiple Intelligences (1983) posits that human intelligence consists of 8 independent subtypes of intelligence: linguistic, logical, spatial, musical, bodily, interpersonal, intrapersonal, and naturalist (Sternberg, 2015). This evidence-based theory looks to eight 'signs' that justify each intelligence subtype as discrete: (1) distinct cerebral territory as evidenced by potential isolation in instances of brain injury, (2) the existence of 'prodigies' in focused areas of talent, (3) an essential core operation at the heart of each subtype, (4) a 'distinctive developmental history leading from novice to master', (5) a 'distinctive evolutionary history', (6)

supportive evidence from prospective research, (7) supportive evidence from psychometric testing, and (8) the 'susceptibility to encoding in a symbol system' or a 'culturally devised arena' (Sternberg, 2015).

Because Gardner's theory does not focus on empirical evidence to objectively assess these subtypes, the theory unfortunately lacks validation, leading many to question its place in modern theoretical psychology. Regardless, the Theory of Multiple Intelligences has inspired countless researchers to reconsider what intelligence is and how it is defined. Many of these researchers have subsequently been successful in validating other theories which address the multifaceted phenomenon of human intellect.

Noncognitive attributes as markers to predict academic success

There is a strong call to identify additional prognostic indicators for the academic performances of medical, nursing, and PA students both in the classroom and on clinical rotations. With the attention theories devoted to intelligence subtypes are receiving, noncognitive attributes that help shape personality by influencing one's interpersonal and intrapersonal interactions have emerged as popular potential metrics to predict success in medical training programs.

The nature of healthcare involves extensive interpersonal communication, often with patients who are in their most vulnerable physical and psychological states, making a healthcare provider's ability to effectively and empathetically communicate a critical determinant in a patient's experience. Additionally, the quality of intrapersonal skills a student possesses within the notoriously high stress working environment of healthcare can meaningfully change the student's experience on clinical rotations and later in medical practice. While didactic teaching methods such as videos, simulations, and lectures can help students prepare for the interpersonal and

intrapersonal struggles that arise in service-related professions, this passive approach to learning leaves these critical skills to be applied and assessed for the first time on clinical rotations.

If a student struggles with proficiency of one or more noncognitive attributes, gaps in their clinical reasoning may be evident, resulting in a poor clinical preceptor assessment and potentially representing the first time a didactically proficient student receives substandard marks. These substandard marks are often unexpected, as students and faculty typically consider academic performance during the didactic year based on the cognitive attributes of didactic proficiency in the form of examination scores testing medical content, not the more subjective skills like effective communication and coping with change. Instances such as this can be emotionally taxing for students, leave faculty at a loss for strategies to help students whose primary setting for learning is no longer in the classroom, and underscore the gap in instructional design of the didactic phase.

Elaborating on Gardner's theory of Multiple Intelligences, Sternberg's Theory of Successful Intelligence (1997) includes intelligence outside the realm of standardized assessment, considering intelligence to be the ability of individuals to achieve their personal goals by successfully navigating decision-making and interpersonal communication within their own sociocultural environments (Sternberg, 2015). This validated theory postulates that human beings have three types of intelligence- analytical, creative, and practical.

Analytical intelligence reflects information processing and application (Kaufman & Singer, 2003). It most closely correlates with the abilities assessed by standardized testing like the Intelligence Quotient (IQ). In the case of PA students, this includes their performances on didactic coursework, End of Rotation and End of Curriculum exams, as well as PACKRAT 1 and 2 scores. As such, analytical intelligence correlates with cognitive attributes.

Creative intelligence is an individual's ability to integrate known and newly acquired information to extrapolate meaning and formulate novel approaches to complex issues (Sternberg, 2015). Creative intelligence plays a role in the ability to uniquely consider numerous components of a situation to understand its "big picture". According to Sternberg, creative intelligence also encompasses a person's ability to not only understand a novel situation or problem, but to also cope with its newness or find a solution to it. This definition closely aligns noncognitive attributes as defined in the domain of trait EI. Creative intelligence in a PA student may manifest as the ability to remain calm in new, high stress clinical environments, maintain focus and project kindness with argumentative patients, and the ability to recognize acute, chronic, and acute-on-chronic manifestations of a single disease state.

Practical intelligence is the ability to apply analytical and creative elements to everyday situations by making decisions to adapt to, shape, or select environments (Sternberg, 2015). In other words, it is the product of utilizing cognitive and noncognitive attributes. Clinical reasoning is an example of Sternberg's theory manifested in a healthcare provider during a typical day on the job- a core competency of the PA profession. Sternberg's theory can therefore be adapted to a PA student as medical knowledge assessed by standard testing plus a measurement of noncognitive attributes, yielding clinical reasoning.

While there are several analytical/cognitive measurements to consider when assessing a PA student, the measurement of creative/noncognitive intelligence proves more challenging. The potential for enhanced clinical reasoning skills with the fostering of creative intelligence, however, makes this endeavor one worthy of contemplation and effort.

Trait emotional intelligence as a teachable, quantifiable, noncognitive attribute

To employ Sternberg's Theory of Successful Intelligence (1997) as a vehicle for illustrating and potentially predicting a student's capacity for practical intelligence (clinical reasoning), the student's creative intelligence- in the form of noncognitive attributes- must be operationalized. When considering options for EI measurement, ability EI and trait EI are both potential options, however trait EI's ability to (1) represent a student's noncognitive abilities on a typical day rather than ability EI's maximum effort measurement and (2) be assessed in a time-efficient and user-friendly fashion via survey, present a more accurate assessment of a student's overall skills and a more practical means of assessing them.

Trait EI, as defined by K.V. Petrides and Adrian Furnham's Theory of Trait EI (2001), presents a means of quantifying an individual's noncognitive attributes. Its use in assessing noncognitive attributes in healthcare students is not unprecedented, and the validated tool to measure trait EI (TEIQue) is available in several versions to address different settings and age groups.

One of the most revered noncognitive attributes among healthcare providers is that of empathy. Empathy takes on numerous definitions depending on the context in which it is considered but can more globally be defined as the ability to be aware of, relate to, and experience the emotions and thoughts of an individual whose experience is not directly related to your own (*Merriam-Webster,* n.d.). Abe and colleagues (2018) found a correlation between trait EI as measured by TEIQue-sf and empathy as measured by the Jefferson Scale of Physician Empathy-student version (JSPES).

The correlation between empathy and trait EI as measured by TEIQue-sf provides a quantifiable assessment for empathy. Because EI is considered a learnable asset, this presents a potential means by which PA students can acquire and hone noncognitive attributes that are highly coveted in medical providers. Low trait-EI scores could trigger faculty to provide enrichment exercises before students embark on clinical rotations. From the perspective of instructional design, discussions on the foundation of clinical reasoning would then include creative intelligence in the form of noncognitive attributes.

Theoretically, empathy (and therefore EI) is an example of creative intelligence as defined by Sternberg's Theory of Successful Intelligence. This links a validated tool to the assessment of creative intelligence in PA students. With trait EI, the application of Sternberg's theory to PA students becomes possible.

Ethical Implications

When considering the addition of novel performance metrics and assessments to a healthcare education program, some hurdles potentially exist. Any new element to an assessment scheme, no matter how much evidence exists to support its use, should be confirmed that such practices are consistent with the program's mission, its competencies, and the competencies mandated by its accreditation counsel as approved methods of instruction and assessment. While simultaneously providing evidence-based and empathetic healthcare is likely to be part of any healthcare program's mission and competencies, all course content and assessments should be verified to be consistent with those program metrics.

Traditional higher education assessment is built upon the ability of a student to recall information taught to them in a didactic or clinical setting and apply that information in simulated and real-life situations. If a trait EI assessment were used to identify students with deficits in the cognitive attributes favorable in healthcare providers and then mandate additional training to foster those skills, one could argue that those students are being tested on information for which the program did not provide instruction.

According to the Accreditation Review Commission on Education for the Physician Assistant (ARC-PA) standard B4.01, assessments must be consistent with 'what is expected and taught' with curriculum that 'builds sequentially upon prior knowledge' (ARC-PA, 2025, B4.01). To remain within compliance of ARC-PA policy, a PA program would therefore need to add the concept of noncognitive attributes and their measurement through trait EI to the didactic curriculum prior to testing. Curricula addressing this content could find a home in didactic classes that explore cultural sensitivity and patient-centered care plans. The subject matter is ideal for active learning, with group work and patient encounter simulations potentially being effective

ways for students to learn about and synthesize this information. Another consideration would be to leave students' trait EI scores out of formal grading and allow their scores and feedback to instead serve as enrichment for the development of trait EI.

Conversely, the ethical implications of *not* assessing noncognitive attributes and the effect of low trait EI should not be dismissed. A deficiency in empathy can inhibit a healthcare provider's ability to establish a meaningful connection with his or her patients, which in turn can lead to patient mistrust in the healthcare provider or even the healthcare system.

In a systematic review by Nembhard and colleagues that examined 470 analyses, it was concluded that greater provider empathy was associated with better patient care experiences and better patient outcomes (Nembhard, et.al., 2022). Indeed, it is easy to see how a patient who feels 'heard' by his or her medical provider could be more likely to trust the provider's clinical acumen and follow through with patient education recommendations. Whether it was initially quoted by Carl W. Buehner or Maya Angelou, the following enduring sentiment captures the essence of empathy in healthcare: 'I've learned that people will forget what you did, but people will never forget how you made them feel.'

Policy Recommendations

Policy changes to incorporate novel educational content and assessments should be presented within the context of their objective evidence of legitimacy and utility. The framework of Sternberg's Theory of Successful Intelligence (1997) serves as a scaffold for presenting an argument for the benefit of objectively assessing noncognitive attributes through trait EI measurement in PA students. In doing so, it also underscores the importance of incorporating curricula for expanding the understanding of these skills and the necessity of their mastery.

Adding to the already extensive list of education topics and assessment methods of the PA education curriculum may initially be met with opposition by some faculty members. With workloads for faculty in all areas of academia steadily increasing (Kelly, 2024) and faculty pay not adequately rising to meet the increase in the cost of living in the United States (AAUP, 2025), faculty may understandably be hesitant to invest their time and efforts into additional responsibilities. However, methods that have the potential to improve student performance during the clinical year present a potential means of decreasing the workload associated with individual needs assessments and remediations that become necessary with students failing to meet minimal competencies. Such a shift may provide balance in faculty responsibilities while simultaneously providing students with a more well-rounded education.

Conduct an institution-specific analysis

The existing research examining noncognitive attributes in medical education is confounded by variability in study design. These studies have shown that different cognitive markers of performance- PANCE, EOR exams, End of Curriculum exams, didactic coursework, and noncognitive markers are more predictive of academic achievement than others, often

depending on the institution investigated. With large variations in cohort numbers, student demographics, curriculum design, and more across different PA training programs, this is not surprising.

Conduct investigative quantitative analysis that considers a variety of performance metrics, both cognitive and noncognitive as measured by TEIQue-sf, as potential predictors of clinical year performance to customize the predictive markers for that program. Identify the statistically significant predictors. If TEIQue-sf scores are among the statistically significant predictors, curricular innovation can be considered.

Educate the sponsoring institution

The implementation of new pedagogy in a program will likely require additional funding from the sponsoring college or university. An evidence-based proposal of the planned curricular changes and the theoretical framework that supports them should be prepared for institution administrators. The proposal should contain an estimated list of expenses related to implementing these changes, which could but is likely not limited to the cost of educating core faculty at a dedicated trait EI workshop, the cost of compensating those core faculty for designing means of educating the rest of the department's faculty, the potential cost of adding additional faculty members, if necessary, to complete these tasks, and the cost associated with licensing for the use of trait EI instruments to assess students.

Educate the faculty

Once institutional support is obtained, educating the department's faculty must be considered next. The path to embracing something new starts with knowledge and understanding. This may be achieved by sending a limited number of interested faculty to an established

educational workshop that teaches trait EI theory and presents practical options for how it can be incorporated into a healthcare education program.

The trained faculty can then design an in-service program to educate the remainder of the department faculty during normal business hours. The goals of such training should be to (1) receive faculty 'buy-in' regarding the need for additional assessment methods to identify students at risk for poor performance in the clinical phase of education, (2) present empiric evidence in support of the role that noncognitive attributes play in performing the job role of a healthcare provider, and (3) illustrate the utility of trait EI as defined by Petrides and Furnham (2001) as a teachable, quantifiable, noncognitive attribute by citing its history of successful utilization in healthcare students. As trained healthcare providers themselves, faculty may be most receptive to quantitative data that supports its use, given medicine's heavy reliance on quantitative test results to assess patient status and direct care.

Design curricula and utilize trait-EI data

Once institutional and faculty buy-in are earned, curricula to educate students on the concept and importance of noncognitive attributes can be designed and implemented in the didactic classroom. Students should be individually assessed using TEIQue-sf, given its efficiency and successful use in other healthcare student populations.

Analyze data to assess the utility of trait EI within the program

Because all institutions possess unique circumstances which may influence the degree of effect to which noncognitive attribute awareness and trait-EI education have on student outcomes, the program should conduct a pilot study of a single cohort to collect data and formally assess the effects seen within the program. Metrics should look at the predictive value of trait EI on student

success in the clinical year and potentially even on PANCE. Qualitative data collected from focus group discussions can help gauge faculty and student perceptions of the effectiveness of the additional education on student performance. Together, the data can be analyzed to determine the effectiveness of this novel approach to education and assessment.

Summary

The skill of a healthcare provider lies not just in the knowledge of medical science but in the effective application of the right medical science for the right individual. The patient may be a neonate or a centenarian, and suffering from any number of comorbidities. This skill- clinical reasoning- represents the 'art' of medicine: the ability to use medical knowledge to diagnose and form effective care plans for patients of different demographics within a variety of social situations and cultural environments, all while considering the abilities, ideals, and resources of the patient.

These high-level critical thinking skills must be carried out under circumstances that are only becoming more challenging to overcome. Healthcare in the United States in 2026 occurs in high-stress environments, caring for patients who often suffer from extensive comorbidities of which they may be poorly versed, in situations where insurances dictate pathways of care that are not always consistent with evidence-based medical practice, and under the omnipresent threat of disciplinary measures should performance metrics not be met. Because of these barriers, medical education should extend beyond the principles of anatomy, physiology, and pathophysiology to include knowledge and skillsets that facilitate the development of meaningful patient relationships while simultaneously promoting personal well-being.

Within Sternberg's Theory of Successful Intelligence (1997), analytical intelligence coupled with creative intelligence yields practical intelligence. When situated within the discipline of medical practice, this theory yields clinical reasoning from the successful, simultaneous utilization of the cognitive attributes of medical knowledge and noncognitive attributes. Noncognitive attributes are well-represented in Petrides and Furnham's Trait Emotional Intelligence Theory (2001), which provides a means of operationalizing noncognitive attributes as a teachable and measurable metric.

Noncognitive attributes housed within Petrides' and Furnham's theory include adapting to unique situations, empathizing with a patient's perspective, social awareness, and maintaining impulse control, all while promoting personal well-being. It is not enough to simply know what antibiotic to give an elderly woman with bacterial pneumonia; the provider must know if the treatment of choice should be reconsidered if its use is contraindicated with the patient's comorbid conditions or if a drug allergy to the treatment has been previously documented. It is equally essential to the patient's outcome that the healthcare provider considers the patient's ability to afford the medication, her ability to administer it properly, and the provider's own proficiency with confirming that the patient understands what the treatment is and why it is being prescribed. These complex tasks are performed for numerous unique cases daily, all while the provider maintains enough motivation and positive sense of well-being that ensures he or she will have the energy to return to work the next day and do this all again.

Many PA educators argue that the biggest leaps in professional development during medical training occur on clinical rotations. According to Mezirow's Transformative Learning Theory (1991, 2012), the practice of clinical reasoning in real-life scenarios and subsequent reflection on those experiences will allow the student to further hone the skill and while doing so, even potentially influence their personal identity. If PA educators can enhance the 'creative intelligence' aspect of their knowledge base, just as they do the analytical knowledge, the application of both in real-life settings may be further cultivated, producing more empathetic, culturally competent healthcare providers. An evolution that often does not take place until a student enters the workforce has the potential to take place during training.

In equating noncognitive attributes with creative intelligence as represented in Sternberg's Theory of Successful Intelligence (1997), it seems intuitive that fostering favorable noncognitive

attributes should play a role in the developing the clinical reasoning abilities of a PA student. If, however, a student's noncognitive attributes as measured by trait EI were proven to accurately predict clinical year achievement, trait EI measurement may also help identify struggling learners before they falter, allowing that student and PA program faculty to take proactive approaches to addressing the student's weaknesses instead of waiting for the student to fail a conventional assessment. This also paves the path for the implementation of novel approaches to instructional design which fosters the development of those noncognitive attributes associated with PA student success.

Because PAs are not required to complete post-graduate residency or fellowship programs, PA students must be ready to efficiently and accurately carry out clinical reasoning upon graduation. It is the responsibility of PA training programs to foster the development of this essential provider skill and ensure their students have secured the skill at an entry level before graduation. In an era of increasing medical complexity and decreasing resources, it is essential that programs reconsider how PA students are assessed and discuss how they can better prepare their students. Training and assessing students in noncognitive attributes may represent a key to successful clinical reasoning.

The implementation of pedagogical approaches to fostering trait EI and the use of trait EI to predict student performance in the clinical year allows for early detection of students at risk for poor performance in ways that traditional cognitive assessments may otherwise fail to capture. Early detection enables early intervention, which can potentially place students at a higher likelihood of success in clinical rotations, boosting their chances of being offered future employment at sponsoring clinical sites, and even potentially enriching the reputation of the training program as a source of competent and capable new graduates.

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