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Self-Regulation And Goal Orientation In Physician Assistant And Medical Students

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SELF-REGULATION AND GOAL ORIENTATION IN PHYSICIAN ASSISTANT AND MEDICAL STUDENTS

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ABSTRACT

Self-regulation and goal orientation both play a crucial role in how medical providers learn and master the knowledge and skills that they will use throughout their careers. It is crucial that practicing physician assistants (PAs) and physicians know how to self-regulate their thoughts and actions and when to use resources such as research and peer advice (Ericsson, 2015).

This research investigated self-regulation and goal orientation in the clinical training of PA and medical students, examined differences between PA and medical students, and provided insight into how goal orientation and self-regulation play a role in the education of these professionals. It was hypothesized that students with adaptive learning behaviors would be more likely to have goal orientations focused on self-improvement and mastery of goals. It was also hypothesized that students with maladaptive learning behaviors would have goal orientations that focused more on achievement for external reasons such as higher grades.

Participants (n = 95) in this cross-sectional study were in the clinical phase of their education. The instrument used in the study was a 40-item survey (Artino et al., 2012) that measured multiple aspects of learning behaviors and goal orientation structures. The finding suggested that PA and medical students that tend to have adaptive learning behaviors generally take a more mastery goal orientation toward their clinical education and that PA students are more likely to ask for help when needed. This study helps to add further evidence to how these medical professionals think about and regulate their learning in their current education and, quite possibly, into their future medical practices.

CHAPTER I

INTRODUCTION

The practice of medicine is often defined as the diagnosis and treatment of disease by a physician. While there are many similar connotations throughout the literature, the definition in the most relevant form is defined by law. In the United States, every state has its own laws that determine who can practice medicine. Within the laws of most states, the practice of medicine is reserved for physicians who have attended and successfully completed medical or osteopathic schools and additional training in specialized fields. While physicians alone have been traditionally trusted with the practice of medicine for hundreds of years, new medical care providers have existed since the late 1960s. One of these relatively new professionals is the physician assistant.

Origin of the Physician Assistant Profession

The concept of a non-physician medical provider dates back to the Civil War era when Dr. Jonathan Letterman, an Army surgeon, instituted multiple means of improving the survival of wounded soldiers in battle. From advancing triage and causality transport methods to training soldiers to take care of other soldiers, Dr. Letterman increased combat medicine to levels not seen before (Smith, 2005). In the early 1900s, the military medical corps developed enhanced training for corpsmen, including extended, more advanced training. Carlisle Barracks in Pennsylvania provided housing for thousands of medical officers that were trained to levels similar to physicians but in a shorter amount of time (Twaddle, 1942). These corpsmen would

care for the wounded during the First and Second World Wars. In the late 1930s and 1940s, thousands of men were medically trained and used in battle only to return home with skills that did not transfer to civilian equivalents. Much, if not all, of their medical knowledge acquired during their duty was forgotten, and they were forced into other professions outside of medicine.

The Needs of Medical Care in Rural America

The need for healthcare in rural and urban underserved areas has been evident throughout the history of the United States (Smedley et al., 2003). It was, and still is, challenging to recruit and retain physicians to work and live in these areas where people lack reliable medical services to survive. Poor access inhibited the ability to seek care, and many people would often forego any preventive care, only to get concerned when conditions such as diabetes, asthma, and heart disease, manifested into proportions that were no longer amendable to conventional medicine (Smedley et al., 2003).

Initial Concepts of the Non-Physician Provider

In 1961, Dr. Charles Hudson, a physician who would become the president of the American Medical Association, published an article titled "Expansion of the Medical Professional Services with Nonprofessional Personnel." Dr. Hudson's initial thought was to educate nurses in a version of a shortened medical program and employ them in underserved areas (Hudson, 1961). Unfortunately, the climate of that time between the nursing profession and physicians was significantly strained due to perceived struggles in the care of patients between the disciplines. Therefore, Dr. Hudson abandoned the concept.

However, after a few years of debate, Dr. Eugene Stead, a physician and chair of medicine at Duke, started the first PA program (Laszlo, 2006). These new programs would

focus on placing NPs and PAs in rural and underserved areas lacking adequate primary care services. PAs would be dependent on physician supervision and were hypothesized to enhance the physician's ability to care for more patients.

The Controversy of Non-Physician Providers

Concerns of autonomy in the practices of non-physician medical providers date back to the years of the creation of these new professions (Estes & Howard, 1969). Johnson (1978) discusses physicians' concerns from the late 1970s about PAs becoming more autonomous. Johnson investigated this with a survey of 37 physician/PA teams in Florida that examined how much autonomy PAs had in their practices with physicians and how both the PAs and physicians perceived the PA's autonomy based on everyday tasks performed in the clinical setting. The study suggested that physicians rated the PA's autonomy at the same level or slightly higher than the PAs rated. However, this small study did not necessarily equate to a rise in PA autonomy; instead, there was a consensus amongst PAs and their physician supervisors about the degree of autonomy in their practices.

Autonomy concerns have swelled over the past two decades as more non-physician medical providers have gained full practice independence in many states (Sarzynski & Barry, 2019). Currently, 27 states allow nurse practitioners to practice without any physician supervision. Far fewer states allow PAs to practice independently; however, numerous states, including North Dakota, Minnesota, and Montana, have recently passed legislation enabling PAs to practice without physician supervision in most settings. Concerns from the American Medical Association (AMA 2013, 2017, 2021) and other specialty physician organizations have led to many nationwide battles about legislation at the state and federal levels. Physician organizations argue that PAs do not possess the amount of education required to practice

independently. However, multiple studies published by physicians, PAs, and others, have consistently shown that the care provided by PAs is as good and sometimes better than the care provided by physicians. This does not include highly specialized care such as surgery, but the studies examine multiple aspects of care provided by non-physician providers (Kurtzman & Barnow, 2017).

Self-Regulation and Achievement Goal Theories

Such changes bring questions on how the education and training of these non-physician providers compare to that of physicians. While there are many aspects to consider, one area that has not been adequately explored relates to educational theory, specifically self-regulation and goal orientation.

Self-regulation theory is described as a continual process with multiple facets by which people monitor their performance and adjust their learning techniques (Bandura, 1991). Critical components of self-regulated learning include planning for tasks, monitoring performance, and reflecting on the outcome.

Achievement goal theory is best described as variations in behavior that people judge their ability and how they define successful accomplishments (Elliot, 1999). As a part of achievement goal theory, there are noted behavior types that further explore the roots of why individuals attempt to gain knowledge. The theory suggests that there are two behaviors that drive these learning processes: mastery and performance goal orientations. People driven by mastery goal orientation look to learn more about the topic or skills they are trying to attain. They go deeper into the subject to learn all the different aspects to expand their knowledge for the greater good. On the other hand, those driven by performance goal orientation strive to increase their knowledge to compete with or be ahead of their peers (Urdan, 2020).

Achievement goal theory and self-regulation theory both play a crucial role in how medical providers learn and master the knowledge and skills that they will use throughout their careers. It is vital that practicing PAs and physicians know when they need to use their resources such as research, peer advice, or knowledge from previous mistakes in caring for patients (Ericsson, 2015).

Therefore, this research investigates self-regulation and goal orientation in the clinical training of PA and medical doctor (MD) students, examines differences between PA and MD students and provides some insight on how goal orientation and self-regulation play a role in these professionals' education and clinical practice.

Theoretical Framework

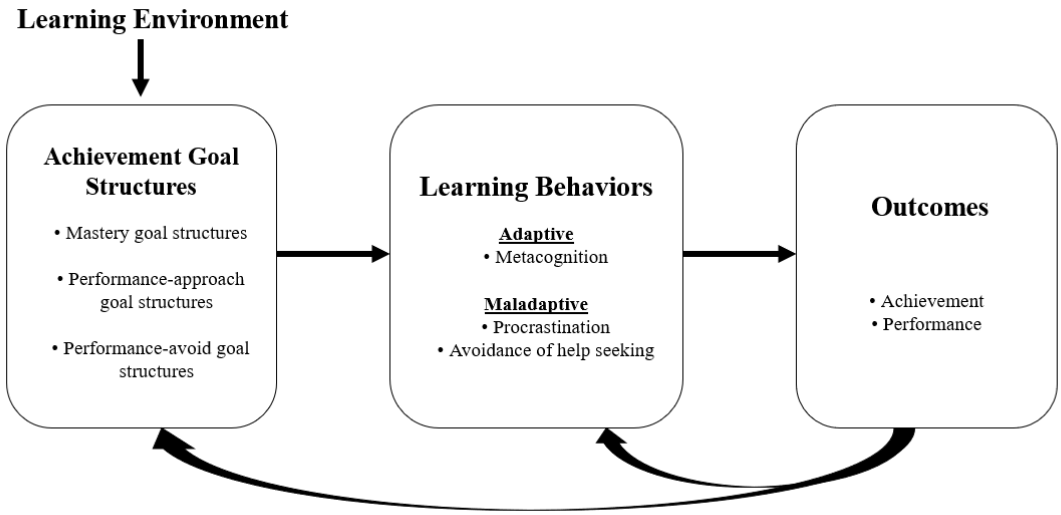
The theoretical basis for the study, adapted from Pekrun (2006) by Artino et al. (2012), relies on a social cognitive model of achievement goal structures and self-regulation (Figure 1). This model suggests that students' perceptions of the learning environment are associated with multiple facets of goal and self-regulated learning strategies. Learning environments can influence how a student views and achieves their goals and can be viewed in different ways depending on their attributes. Some are considered adaptive and allow for healthy self-improvement, while others are more maladaptive (Karabenick, 2004). How learning environments affect the goal orientations of students are referred to as goal structures. Learning environments where students perceive that they should focus on their grades rather than mastering the needed skills for their discipline are considered performance-approach goal structures (maladaptive). Learning environments that encourage students not to exhibit signs of incompetence are considered performance-avoid goal structures (maladaptive). Lastly, learning environments that inspire students to focus on developing needed skills, accomplishing

complex tasks, and thoroughly understanding key concepts are considered mastery goal structures (adaptive).

Similarly, among learning strategies, some are considered adaptive and others maladaptive. Adaptive strategies consist of metacognition, or metacognitive control strategies, in which students focus on learning from their experiences and think about how they are thinking about learning (Flavell, 1979). Maladaptive strategies include characteristics such as procrastination, during which students delay accomplishing tasks, and avoidance of help-seeking, in which students avoid asking for help when needed (Ryan et al., 2001).

Figure 1

Theoretical Framework of Achievement Goal Structures and Self-Regulated Learning



Note: Adapted from Artino, A. et al. (2012).

Purpose of Study and Research Questions

The purpose of this study is to examine goal orientation and self-regulation in PA and MD students in the clinical phase of their education and to determine if there are significant

differences between the two groups. The study will also examine differences between early and late-phase clinical students.

Research Questions

1. Are PA and MD students' perceptions of mastery goal orientation correlated with adaptive learning behaviors and maladaptive behaviors?
2. Are there differences between early- and late-phase clinical students in relation to goal orientation and learning behaviors?
3. Are there differences between PA and medical student self-regulation and goal orientations?

A comprehensive review was performed to identify research and provide answers to these questions. Multiple databases were used in the search, including Academic Search Premier, CINAHL, ERIC, Psych INFO, and PubMed. Keywords included self-regulation theory, self-regulation, achievement goal theory, mastery goal theory, goal orientation, metacognition, medical education, autonomy, physician assistant, and physician. The literature review revealed a nearly complete lack of research in the study area concerning PA students. The amount of research on MD students is fairly robust regarding self-regulation and goal orientation; however, only a handful of studies explored the relationship between self-regulation and goal orientation during the clinical phases of students' education.

Significance

Given a nearly complete lack of research on PA students concerning self-regulation and goal orientation, the gap in the literature is significant. Due to this, no direct comparisons have been made between PA and MD students that explore these essential attributes of future

medical professionals. With the concerns of PA autonomy, a natural starting point of research during the clinical education phase of each group is of most interest.

Most critics of non-physician medical provider autonomy base their argument on the duration, depth, and breadth of physician education compared to non-physician medical providers, in this case, PAs. While these arguments certainly have some merit, numerous studies have shown comparable patient outcomes between physicians and PAs. These studies primarily focus on the outcomes but do not explore the issues further, such as the similarities and differences between physicians and PAs regarding how they learn, use self-regulation, and view goal orientation.

Delimitations

The sample of students in the study was limited to PA students and MD students in the clinical phase of their education in their respective programs. Participants were also limited to one institution that is a research-centric, upper Midwest university. Participants were recruited via email and only included students that were currently in the clinical phase of their education and training.

Limitations

Limitations to the study include that it was not a longitudinal study, but rather a cross-sectional one. The research was in survey form and relied on students answering accurately based on the questions provided. This can add a risk of more socially acceptable responses even though the survey will be anonymous.

Assumptions

The survey was administered in an electronic, online format. Assumptions include 1) the participants are truly PA or MD students, 2) that the participants answered truthfully and

not with more socially acceptable responses, and 3) that the participants understood the questions as provided and in the specific context being studied.

CHAPTER II

LITERATURE REVIEW

Social cognitive researcher Albert Bandura described self-regulation as a process in which people regulate their ability to learn and function within society through monitoring their own behavior, judging their behavior in context with their goals and environment, and their ability to self-reflect on their experiences (Bandura, 1991). In medicine, self-regulation is necessary for professionals to manage their ability to safely care for patients and continue lifelong learning in an ever-changing field (Berkhout et al., 2017; Cleary et al., 2018). While many researchers have looked at self-regulation from different aspects of medicine, the most critical aspects as it pertains to the purpose of this research are within the clinical arena and practicing independently. To practice medicine safely, one must recognize their abilities, know their limitations, learn from their mistakes and successes, and repeat this process daily. While many people possess some natural, inherent self-regulation, it must also be facilitated and reinforced during the training of medical professionals.

While there are various models of self-regulation throughout the literature, the majority of studies support a simplified cyclical fashion of the general process. This cyclical process involves three general phases; the before phase, the during phase, and the after phase (Zimmerman, 2000). The before, or preparatory, phase is when people consider the task at hand and set goals and specific plans for tackling the task. In the during phase, people monitor their planned processes and employ different methods of managing their cognition, behavior, and emotions. Finally, in the after phase, people self-reflect and consider the process from the

start to determine how effective their efforts were and how to further improve upon or identify factors that may inhibit future tasks of a similar nature. This process is then repeated or reassessed as the task or new goals emerge.

Theoretical Framework

The theoretical basis for the study, adapted from Pekrun (2006) by Artino et al. (2012), will rely on a social cognitive model of achievement goal structures and self-regulation. This model suggests that students' perceptions of the learning environment are associated with multiple facets of goal orientation and self-regulated strategies. Some of the strategies are adaptive, while others are maladaptive. Adaptive strategies consist of various metacognitive attributes and achievement of mastery goals. Maladaptive strategies focus more on a competitive learning environment and attributes such as procrastination.

Definitions

Self-efficacy: a person's belief in his or her capability to successfully perform a particular task (Bandura, 1982).

Mastery goal structure: an environment in which the instructional practices and norms convey to students that learning and understanding are important, that effort and improvement are valued, and that all students are valued (Wolters, 2004).

Performance-approach goal structure: an environment that communicates to students that achievement is more important than effort and that doing better than others is more valued than individual improvement (Ames, 1992).

Performance-avoid goal structure: an environment in which there is the desire to avoid demonstrating inferior abilities (Skaalvik & Skaalvik, 2013).

Metacognitive strategies: students' efforts to regulate learning activities; awareness and understanding of one's own thoughts (Flavell, 1971).

Procrastination: an awareness that a task needs to be completed, but failing to complete it in the desired time (Wolters, 2003).

Avoidance of help-seeking: the degree to which students avoid seeking help, even when they need it (Pajares et al. (2004).

Self-regulation and Goal Orientation in MD students

Pre-clinical Phase Evidence

MD students are under extreme pressure to perform well, which can affect their motivation, but they must continue to move on in their studies. While general aptitude and the ability to retain knowledge are requisites of acceptance into a medical school, the vast amounts of information presented to them during their education can be quite challenging to manage. Therefore, the ability to study efficiently is needed to consume and retain that information (Bruin et al., 2017). Sawatsky et al. (2021) discuss the importance of realizing the future autonomy of physician trainees and note the critical need for autonomy while students and medical residents develop in their training. However, with significant autonomy, questions arise about patient safety and monitoring those without adequate experience. While supervision and autonomy are different ends of a spectrum, training must involve a well-balanced combination of both to ensure patient safety and the growth of professional independence.

Much of the related literature focuses on self-regulation in the pre-clinical phase of medical education and methods of instruction. Poitras et al. (2018) investigated self-regulation of didactic phase MD students using an online, case-based learning platform with subsequent data mining. The study's main focus was to design a process that supported MD students'

ability to work through medical cases and improve diagnostic reasoning through feedback mechanisms. The authors developed a rubric based on a self-regulation theory to examine multiple aspects of student performance. Students were required to interact within simulated scenarios during the online cases in assessing, diagnosing, and treating patients. The online software logged their interactions and time to completion throughout the scenarios within the system. The researchers then harvested this data and applied it to the rubric. Though this study was not designed to measure differences among participants in the areas of self-regulation, it did identify different means by which monitoring student self-regulation can be attained and further monitored and groomed to improve their ability to self-regulate later in their careers.

One common pre-clinical adjunct for learning about clinical medicine is simulation. Medical simulations are a technique during which students are presented with a medical case scenario and subsequently interact with different modalities, such as computer-generated patients or live scenarios with high-fidelity manikins. Students are required to obtain information from the simulated patients and make decisions on diagnoses, treatments, and other interventions. Simulation provides a safe environment where students can evaluate and manage patients without any possibility of harm to actual human patients. Cleary et al. (2019) examined first-year MD students (n = 157) in simulated clinical experiences, specifically focusing on their ability to assess patient history and physical exam elements. Following the simulated clinical experience, students were asked to self-assess their performance. In addition, their performances were also graded by experts in the field. The researchers found that the students in the study consistently overestimated their performance in history taking but were more accurate in areas of self-assessment in physical exams. It was concluded that novice-level students tend to overrate their abilities, which brings into question issues with metacognitive

measures and significant bias on how they perform. This also suggests that there is much need for continually assessing MD students' abilities and encouraging reflection on their performance to assure patient safety in the future.

A commonly used measurement for self-regulation involves the self-reported Motivated Strategies for Learning Questionnaire (MSLQ). The MSLQ (Pintrich et al., 1991) is an 81-question survey that assesses six motivation subscales and nine learning strategy subscales. Each of the items in the MSLQ is typically measured on a seven-point Likert scale, and statistical analysis is performed to assure reliability and validity. Within the MSLQ, questions related to self-regulation are further delineated into the three phases discussed previously. Stegers-Jager et al. (2012) studied first-year MD students using the MSLQ and compared the results with their performances on multiple course examinations completed throughout the subsequent semesters. Study participants, two cohorts over consecutive years (n = 303, n = 369), were also queried about their attendance in lectures, skills labs, and other educational events for the curriculum. Data analysis suggested that students with higher levels of measured self-regulation were more successful than those with lower levels. The study's overall findings suggested that participation in curricular activities for first-year MD students likely mediated relationships between learning strategies, motivation, and their performance in the first year of medical school.

Awareness of your abilities and aptitude is critical for those who practice medicine. Gandomkar et al. (2016) studied self-regulation in MD students by introducing a biomedical learning task and obtaining measurements of self-regulated learning before, during, and after the task. The authors utilized a microanalytic assessment protocol consisting of a self-reported measurement tool to assess self-regulation processes and qualitative measures to obtain a

broader sense of the students' mindset. The sample of 78 students was subdivided into two study groups, one of higher performers and one of lower performers. The study revealed a significant difference in measured self-regulation between the groups, with the higher-performing arm doing so on the study task. The group that previously performed poorly in their studies also did poorly on the study task. These findings provide evidence of a correlation between academic performance and a crossover to future tasks related to adaptive skills such as metacognition and self-regulation.

Professionalism in medicine is a required quality that affects many aspects of one's career. From patient safety and satisfaction to being a trustworthy team member, medical school stresses professionalism in many ways. Mak-van der Vossen et al. (2018) examined MD students' professionalism through an expert panel of medical educators who were tasked with rating needed qualities of self-regulation and metacognition in those students. In this mixed-method study, seasoned medical educators ranked the qualities of MD students they felt were necessary to become successful clinicians. With these determinations, their goal was to distinguish the need to intervene with students exhibiting signs of unprofessional behavior. While this study incorporated an expert panel design in a primarily qualitative fashion, the findings were consistent with other literature that stressed the necessity for students to become reflective and adaptable to the changing conditions in medical school and, subsequently, medical practice. An interesting aspect of their findings was a potential pattern observed in some students who exhibited signs of unprofessionalism by masking their participation in a "gaming the system behavior" or essentially going through the process without planning to apply what they learned. The findings stress the importance of monitoring students' academic

progression, professional behaviors, and recognizing signs of poor adaptability and reflective practices.

Clinical Phase Evidence

Transitioning from the classroom to the clinical side of medical education affects MD students in various ways. Cho et al. (2017) studied MD students that recently transitioned from the didactic phase of their education to the clinical phase by administering the MSLQ at the start of their clinical rotations, followed by a repeat administration of the MSLQ ten weeks later. They found that after ten weeks in the clinical phase, there was a significant increase in extrinsic goal orientation and a decrease in the metacognitive side of self-regulation. The analysis suggested that the most likely explanation for the significant changes was related to the gender of students and also any previous clinical work they had done prior to medical school. Male participants were more likely to increase extrinsic goal orientation than females, whereas metacognition was better maintained in students with previous clinical experience.

Artino et al. (2012) studied MD students' perceptions of achievement goal structures at different phases of their training and their reported use of three learning behaviors: metacognition, procrastination, and avoidance of help-seeking. The sample (N = 304) included 223 men (73%) and 81 women (27%), which is representative of the medical student population at their institution. Results from the factor analysis validated the survey's six-factor structure. Each subscale of the 30-item survey was deemed reliable by Cronbach alpha coefficients ranging from 0.78 to 0.91. The authors found multiple significant correlations that supported their hypothesis, including students' perceptions of mastery goal structures which were positively correlated with metacognition ($r = 0.26$, $P < .01$) and negatively correlated with procrastination ($r = -0.16$, $P < .01$) and avoidance of help-seeking ($r = -0.24$, $P < .01$).

They also found that performance-approach goal structures were positively correlated with performance-avoid goal structures ($r = 0.47$, $P < .01$) and cumulative medical school GPA ($r = 0.14$, $P < .05$). Additionally, performance-avoid goal structures were positively correlated with help avoidance ($r = 0.24$, $P < .01$), and metacognition measurements were negatively correlated with procrastination ($r = -0.12$, $P < .05$).

Artino et al. (2012) had several limitations including a single-institution, cross-sectional nature of the study design and a modest response rate (45%). The authors noted that further studies would also include longitudinal research to explore changes amongst students across time. Lastly, since it was conducted primarily as a survey, socially desirable responses may have occurred; however, factor and reliability analyses suggested that the survey and design were statistically sound.

While in clinical training, MD students become a part of a team that constantly interacts to pursue quality patient care. Physician mentors, nurses, respiratory therapists, clinic managers, receptionists, medical assistants, and others are team members that may influence MD students. Berkhout et al. (2017a) examined how MD students in the clinical setting perceived the influences of others on their self-regulated learning. The researchers conducted a qualitative study of 14 MD students using a grounded theory methodology. The study suggests that influences from other people during clinical training affected the MD students' goal setting, learning opportunities, self-reflection, and ability to manage their emotions. The researchers noted several external factors that affected students' perceptions of their learning processes ranging from non-clinical relationships (friends, family) to concerns of others in the hierarchy of medical practice. Those that focused on a more global picture of external influence, such as family and friends, were typically students in the earlier phases of their

training. As students became more experienced, their focus shifted to a more defined pattern of influence of people in their clinical lives. The authors suggest that significant support from those who interact with MD students is vital to ensure that their self-regulating abilities progress as they become more attuned to responsibilities in their future roles.

Bransen et al. (2019) examined self-regulation in MD students participating in clinical rotations to help further identify areas where self-regulated learning was affected or supported by others within the clinic setting. There were eleven participants in this qualitative study informed by the principles of constructivist grounded theory. The researchers found that self-regulated learning and self-regulated learning development were rooted in interactions among those in the clinical arena. This process continued from previous experiences, allows for further usage later in their careers as lifelong learners. The authors also stressed that MD students within the clinical setting should be included as peers to help develop a culture that encourages further inquiry and reflection on the processes that take place daily.

It is essential to monitor, recognize, and categorize self-regulation abilities in MD students while they are in their clinical training. This is typically the job of preceptors and faculty that serve to mentor and facilitate medical student learning and performance. Berkhout et al. (2017b) examined MD students' self-regulated learning behavior patterns in a clinical setting using a quasi, mixed-methods approach. Seventy-four MD students participated in the study, which ultimately revealed five regulated learning patterns. Through their analysis, the authors recognized five patterns that explained 43% of the total variance in the data. The first pattern identified was labeled "engaged" and consisted of students who were motivated, able to work in stressful environments, and actively shaped their learning through self-regulation processes while in their clinical rotations. The second pattern was labeled "clinically

opportunistic" and noted that these students, while enthusiastic, tended to lose motivation if they were not enjoying themselves in their clinical environment. In addition, this group tended to seek feedback and interact better with their supervisors. The third pattern was labeled "uncertain," in which the group showed evidence of being easily overwhelmed in stressful situations, but also sought to appear competent in the eyes of their supervisors. These students focused on taking experiences as they came and not purposefully setting goals or seeking out other learning opportunities. The fourth pattern was labeled "restrained" and consisted of students that were motivated to learn and less concerned with enjoying their time in the clinical setting. This group was less likely to include others in the process of learning, such as their supervisor or peers, and was felt to be due to a fear of seeming inferior or wrong in their decisions and answers to others. The last pattern labeled by the authors was "effortful" and was defined as students that were always prepared and worked hard at their education; however, they relied heavily on their supervisor for guidance as they could not design winning goals on their own for their success. The authors suggest that self-regulated learning behavior and the context in which it was observed were closely related and that further interventions before the clinical phase, in areas such as problem-based learning, would likely benefit most students and help facilitate additional self-regulating qualities required of them in their future practices.

Another essential aspect of self-regulation in clinical practice is avoiding overconfidence in one's abilities and knowledge. Yagil et al. (2021) examined physician overconfidence by interviewing 22 physicians in various medical specialties. The data were collected through semi-structured interviews and were analyzed using a grounded theory technique. Data analysis revealed multiple themes, including the need for awareness of overconfidence. The authors noted that this awareness of overconfidence was not always of

self-awareness but also of recognizing overconfidence in others. Another theme identified was a "mundane professional identity" in which physicians feel that most of their work is not a product of their own making. With guidelines, scientific studies, and expert organizations determining what is right, physicians felt they did not control much of what they do. For instance, one physician noted: "Medicine is not a difficult profession; you have to work according to certain rules, which are written, you did not invent them. If you work according to the rules, you are a good doctor" (Yagil et al., 2021, pg. 938). Physicians in the study reported that it was not necessary to be extremely intelligent to practice medicine, but it was essential to have a process of monitoring and self-reflection. Ultimately, the authors noted that in an effort to decrease the possibility of overconfidence, physicians typically would create strategies to help balance their perceptions of control and evaluate their strengths and weaknesses in an ongoing process that typically results in less overconfidence as they become more seasoned in their profession.

Dunphy et al. (2009) studied the cognitive elements in the clinical decision-making of practicing obstetricians. The participating physicians (n = 12) were queried with multiple psychological questionnaires, including scales that measured reflective coping, proactive coping, tolerance for ambiguity, need for cognition, state trade anxiety inventory, and metacognitive awareness inventory. After completing the surveys, data on delivery outcomes (of babies) from the physicians' practices were collected (the time frame was not indicated in the publication). The researchers found that obstetricians who scored highly in reflective coping and cognition are more likely to have positive outcomes for their patients. Conversely, those scoring higher in trait anxiety areas were likelier to have poorer outcomes. The authors also note that the metacognitive awareness inventory scores were not correlated with poorer

outcomes. Though the measurement of metacognition did not predict poorer outcomes, the authors state that their findings did not necessarily prove that metacognition processes were not important. They did feel that metacognition plays a role in multiple aspects of other measurements performed in the study and correlated to better outcomes.

Specific technical procedures in medicine are commonplace throughout most specialties. In a study performed by Cook et al. (2018), MD students and physicians in training (n = 40) were evaluated on the performance of a simulated procedure that was preceded by varying levels of training prior to the simulation. Study groups were different in areas such as setting goals, time to finish the procedure, and success of completion. The authors found that varying levels of self-regulation support had different effects on the study participants and their procedure performance. Participants who were provided more structure and goals for the procedure demonstrated higher levels of task completion and better efficiency. Those that were not provided goals or a structured method of completing the procedure were less likely to complete the procedure successfully and took more time. One of the study groups was assigned a success-oriented training structure, while the other group had a failure-oriented training structure. Surprisingly, the failure-oriented group had faster completion times but also had lower persistence in completing the task (for those that were not successful, some were successful). This study demonstrated that structured instruction, focusing on self-regulation, provides a framework for students and physicians to use their core processes of metacognition and goal achievement.

Self-regulation and Goal Orientation in Physician Assistant Students

The literature lacks research on self-regulation and goal orientation of physician databases. Only one study of PA students was found that was remotely relevant to the current study.

Garino (2019) conducted a qualitative study to explore how medical and PA students in their clinical phase use feedback from their mentors and if motivational goals provide any insight into differences between the two groups. A semi-structured interview protocol was used to interview eight PA and five MD students. The researcher found that the participants felt they needed to be ready, willing, and able to receive criticisms and feedback from their mentors. Emotions, value in the process, and a growth mindset were all common in successful feedback. The author recommended further research on achievement goal theory and self-regulation theory in PA and MD students.

The only other article remotely related to metacognition focused on a specific teaching concept for metacognition in PA education using student response systems, or clickers, versus low-technology response systems (Brady & Forest, 2018). The goal of this study was not to evaluate metacognition practices in PA students. Instead, it was designed to determine which instruction method was better for PA students' education about metacognition. Therefore, there is a significant need for more research on this population.

Summary

The research evidence for MD students and physicians is fairly robust. There are ample studies investigating many aspects of self-regulation theory and goal orientation. In the pre-clinical phase of medical school, the research focuses primarily on ways to encourage self-regulating behaviors and metacognitive recognition to improve MD students' efficiency in studying (Swatatsky et al., 2021), learning issues and strategies (Poitras et al., 2018; Cleary et al., 2019; Gandomkar et al., 2016), and identify student issues early (Mak-van der Vossen et al., 2018). The research evidence shifts somewhat in the clinical phase due to the inherent differences between the didactic studies and clinical performance. Clinical phase studies focus

heavily on how self-regulation and goal achievement are affected by others within the clinical arena (Artino et al., 2012; Cho et al.,2017; Berkhout et al., 2017a), how they help future physicians to recognize patterns and behaviors that may cause issues with patient safety such as overconfidence (Berkhout et al., 2017b; Yagil et al., 2021), and how MD students use self-regulation and goal achievement in settings where procedures and other tasks are performed (Artino et al., 2021; Dunphy et al., 2009; Cook et al. 2018).

The research on self-regulation and goal achievement in MD students and physicians provides a well-rounded view of how these theories apply to independently practicing medical providers to help improve their learning, monitoring of thinking and behavior, and promoting the application of these qualities throughout their professional careers.

As for the research on self-regulation and goal orientation in PA students and practicing PAs, there is a significant deficit and further need for research.

CHAPTER III

METHODS

The purpose of this study was to examine goal orientation and self-regulation in PA and MD students in the clinical phase of their education and to determine if there are significant differences within and between the two groups. A non-experimental, cross-sectional, survey-based research method was used in this study. Previous studies have been performed on numerous other types of students, including MD students, but none have looked at PA students. Prior use of the research instrument helps to provide reliability and validity of the items and constructs that are being evaluated. The instrument used relies on a social cognitive model and was adapted by Artino et al. (2012) from Pekrun (2006.) The survey was designed to assess achievement goal structures, self-regulation, and certain aspects of self-efficacy in clinical phase MD students.

Research Questions

1. Are PA and MD students' perceptions of mastery goal orientation correlated with adaptive learning behaviors and maladaptive behaviors?
2. Are there differences between early and late-phase clinical students in relation to goal orientation and learning behaviors?
3. Are there differences between PA and medical student self-regulation and goal orientations?

Setting

The study was performed at an upper Midwest research university's medical school and

PA program. The medical school was a four-year postgraduate program consisting of 20 months of didactic study followed by 26 months of clinical rotations. Third-year MD students had completed approximately eight weeks and fourth-year MD students had completed approximately 50 weeks of clinical rotations at the time of the survey.

The PA program was a two-year master's degree program consisting of approximately one year of didactic work and 12 months of concurrent and subsequent clinical rotations. PA students begin their clinical rotations in the first year after completing basic sciences coursework and the first of three clinical medicine courses that covered conditions in six major body systems commonly seen in primary care. First-year PA students had completed eight weeks and second-year PA students had completed approximately 44 weeks of their clinical rotations at the time of the survey.

Participants

The sample population for the study was students in the clinical phase of their education/training in both the PA and MD programs. The total number of students that were eligible for the study was 205. Within the PA program, there were 49 females and 16 males. For first-year PA students, there were 26 females and six males. For second-year PA students,

Table 1

Demographics of Research Population

	Sample population	
Demographic	*N*	%
Gender		
Female	112	54.6
Male	93	45.4
Total	205	100
Year in program		
PA first-year	32	15.6
PA second-year	33	16.1
MD third-year	66	32.2
MD fourth-year	74	36.1

there were 23 females and ten males. Within the MD program, there were 63 females and 77 males. For third-year MD students, there were 32 females and 34 males. For fourth-year MD students, there were 31 females and 43 males (Table 1).

The research sample included a total of 95 students, 60 from the PA program and 35 from the medical school. There were 31 (32.6%) first and 29 (30.5%) second-year PA students, 16 (16.8%) third-year, and 19(20%) fourth-year MD students. The mean age for PA students was 29.2, for MD students 26.3, and overall mean age of 28.1. There were 60 (63.2%) female and 35 (36.8%) male students. The sample was representative of the sample population as there were 45% female and 55% male MD students in the sample population and 49% female and 51% male MD students in the sample. For the PA students, the sample population was 75% female and 25% male; the sample consisted of 72% females and 28% males (Table 2).

Table 2

Demographics of Research Sample vs. National Population

	PA Sample		PA Nationally		MD Sample		MD Nationally	
Demographic	*n*	%	*N*	%	*n*	%	*N*	%
Gender								
Female	49	**72.2**	14,813	**72.6**	17	**49**	10,315	**49**
Male	16	**26.4**	5,587	**27.6**	18	**51**	10,736	**51**

From a national perspective, there were 9,426 second-year PA students in 2020 (PAEA, 2021), of which 72.2% were female and 26.4% were male (1.4% did not identify as male or female.) Nationally for MD students, there were 21,051 in their third and fourth years, of which 51% were female, and 49% were males (AAMC, 2022). The delineations of MD students in specific years were not available. However, in the review of data available from the last four years, enrolled MD student numbers do not vary significantly from year to year.

Instrument and Measures

A quantitative, non-experimental research method was used to conduct this study. Previous research on MD students has shown evidence of the reliability and validity of such methods. The instrument used for the study was a 40-item survey previously used by Artino et al. (2012) with minor modifications made to fit use with the study institution and the use of locally accepted terminology as it pertains to the clinical setting (Appendix A). Survey items were obtained via email, and permission to use the instrument was given by the primary investigator of the previous study (Artino et al., 2012) (Appendix B). The instrument was a composite of three established instruments that measured achievement goal structures, learning behaviors, and help-seeking tendencies. Achievement goal structures were measured using three subscales adapted from the Patterns of Adaptive Learning Scale (Midgley et al., 2000). Learning behaviors were measured using three subscales from the Motivated Strategies for Learning Questionnaire from Pintrich et al. (1993) and Help-Seeking Scales from Pajares et al. (2004). Demographic information obtained from participants that were used for this study included program (PA or MD student), year in program, gender, and age.

There were eight constructs within the 40-item survey that examined achievement goal structures, learning behaviors, and perceived performance. Achievement goal structures included mastery goal structures, performance-approach goal structures and performance-avoid goal structures. Learning behaviors consist of two subcategories, adaptive learning behaviors, such as metacognition, and maladaptive learning behaviors, such as procrastination and avoidance of help-seeking. Perceived performance focused on confidence in basic skills self-efficacy and advanced skills self-efficacy.

The item key, found in Appendix C, contains all of the measures used in the current

study, including demographic questions and individual scale items. To examine learning environment constructs, including performance-goal structures (Q1-3), mastery goal structures (Q4-8), and performance-avoid goal structures (Q9-13), the item questions were prefaced with "The following items address your rotations/clerkships and the work you do in them. In your rotations/clerkships…" For learning behavior constructs, including metacognitive control strategies (Q14-21), procrastination (Q22-26), and avoidance of help-seeking (Q27-30), questions were prefaced with "For each item, select the response that best reflects how often you perform the various behaviors. In your rotations/clerkships, how often do you…" Lastly, to examine perceived performance constructs, including basic skills self-efficacy (Q31-36) and advanced skills self-efficacy (Q37-40), item questions were prefaced with "For each item, select the response that best reflects your level of confidence at this point in your medical training, how confident are you that you can…"

To measure responses, a five-point Likert -type scale was used with various responses that pertained to the specific area that was being studied. For the items in achievement goal structures constructs, response choices included "extremely untrue" = 1, "somewhat untrue" = 2, "neutral" = 3, "somewhat true" = 4, and "extremely true" = 5. For the items in the learning behaviors constructs, response choices included "almost never" = 1, "once in a while" = 2, "sometimes" = 3, "often" = 4, and "almost all the time" = 5. And lastly, for the perceived performance/self-efficacy constructs, response choices included "not confident at all" = 1, "slightly confident" = 2, "somewhat confident" = 3, "quite confident" = 4, and "extremely confident" = 5.

Procedure

Priori and post hoc power analyses were performed using G*Power version 3.1.9.6

(Faul et al., 2007) to determine the sample size needed for the study hypothesis. The priori analysis for a power of 80% with a type I error rate of 5% determined a sample size of 71 at an effect size of 0.4 (medium effect.) Post hoc analysis based on the 95 participants and Cohen's *d* range from 0.53 to 0.94 on independent sample t-tests that were considered statistically significant and were all over 80%.

Institutional review board approval was obtained before recruitment began (Appendix D). Participants were recruited from the MD and PA programs via email. Participants were required to be in the clinical phase of their education/training to be included in the study. Each group of students received the same email describing the study and was given an estimated survey time of approximately ten minutes. To keep responses anonymous, participants who completed the survey could click on a separate link and enter their name and email address for the incentive drawings. Incentives were included for those that completed the study. The data from the drawing was not available to the primary investigator and was constructed and managed by a faculty member that was not otherwise involved in the research. The incentive prizes included an electronic stethoscope and two $50 gift cards. There were no other incentives or direct benefits to participants identified in the instructions or survey. Informed consent was provided at the start of the survey and implied if the student continued to complete the survey (Appendix E).

Data Collection

Data was collected using Qualtrics (www.qualtrics.com) and analyzed by IBM SPSS Statistics 28.0.0.0. Data were screened for missing values and insignificant outliers. Only one responder to the survey was removed due to numerous missing responses. Descriptive statistics and frequencies were examined for normality and reliability. All items were adequate both in

skewness and kurtosis (Appendix F).

Confirmatory factor analysis was performed on the survey items and revealed 11 components, three additional to the eight constructs (Appendix G). The extraction of components was set for an Eigenvalue of greater than 1.00 and coefficients less than .30 were removed. The eight factors that coincided with the determined constructs accounted for 59% of the variance. Constructs that factored appropriately without significant crossover into one of the three extra factors were metacognitive control strategies, performance-avoid goal structures, procrastination, avoidance of help-seeking, and performance-approach goal structures. One item, Q4, "Really understanding a patient's clinical problems is the main goal," in the mastery goal structures construct only had a coefficient of .120 within that construct and a coefficient of .620 in factor 10. This item was kept as a part of the construct as it still had adequate reliability and correlation with the other items in the construct, and there were no other items with significant coefficients in the extra factor. Within the self-efficacy construct as a whole, all items loaded well into one factor, but there were some variations in loading for items that were considered basic skills. Not all of the anticipated basic skills had sufficient coefficients to be grouped into one factor, with two items factoring into the self-efficacy factor as a whole (both basic and advanced skills self-efficacy). These were questions Q34, "At this point in your medical training, how confident are you that you can accurately gather essential information from a patient?" and Q34, "At this point in your medical training, how confident are you that you can demonstrate caring when counseling a patient?". While considered basic skills compared to advanced skills such as generating a patient-specific treatment plan, these two aspects were also kept in the construct as the correlations and reliability were adequate with them included.

Reliability analysis was also performed for the items in each construct with a Cronbach's alpha of at least .06 was desired, which all achieved with two noted exceptions. One item was in the metacognitive control construct, and the other within the self-efficacy. Within the metacognitive control construct, Q17 was removed due to poor loading into the construct. The question for this item was, "In your rotations/clerkships, how often do you make sure you sort out any issues before proceeding to the next activity?" This issue was evident during the initial analysis as it caused a slight decrease in the attainable Cronbach's alpha and added an additional factor in the confirmatory factor analysis. Within the self-efficacy construct, Q39 was removed as it also was inconsistently answered by study participants. The item in question asked about the participants' confidence in balancing professional and personal responsibilities. In retrospect, this question did not seem consistent with other self-efficacy questions within the constructs. All other questions focused more on confidence in clinical skills and knowledge, while this question was related more to other non-clinical and life balance factors.

The means of items in each construct were then calculated, descriptive statistics and frequencies were examined for normality and reliability, and correlation analysis was performed using Pearson's correlation coefficient and reliability determined using Cronbach's α. Cronbach's α statistics ranged from $\alpha = .636$ for advanced skills self-efficacy to $\alpha = .814$ for metacognitive control strategies (Table 3).

Further statistical measures were performed on the data following correlation analysis to analyze the study questions and hypotheses. Independent sample t-tests were performed on all eight of the constructs comparing PA students versus MD students, first-year PA students versus second-year PA students, third-year MD students versus fourth-year MD students, first-

year PA students versus third-year MD students, and second-year PA students versus fourth-year MD students. The analyses between first-year PA students and third-year PA students, and likewise between second-year PA students and fourth-year MD students, were performed as both of these groups of students were either in their first or second year of their clinical training. Given that the PA program is a two-year program and the MD program is a four-year program, first-year PA students would be similar to third-year MD students and second-year PA students, similar to fourth-year MD students. Significance for the findings was set for a type I error rate of .05 and a critical t = 1.66 based on power analysis. The effect size was also estimated based on Cohen's *d* using commonly acceptable limits for effect sizes, with 0.20 – 0.49 considered a small effect size, 0.50 – 0.79 considered a medium effect size, and 0.80 and larger considered a large effect size. (Cohen, 1988)

Summary

In this chapter, the methods of the study were discussed, and determinations on which items were included in the study were explained. Overall, the survey performed well with the constructs that were determined prior to deployment. With only a couple of minor issues in the CFA and reliability analyses, the instrument has provided adequate data to further assess the research questions.

CHAPTER IV

RESULTS

This chapter will review the results of the survey that was completed by the 95 study participants in relation to the research questions. The results will be presented in a format that addresses each research question.

Research Questions

Question 1: Are PA and MD students' perceptions of mastery goal orientation correlated with adaptive learning behaviors and maladaptive behaviors?

An analysis of the six constructs within the learning environments and learning behaviors was performed using correlations to answer this question. Learning environment constructs consisted of performance-approach, performance-avoid, and master goal structures. Learning behaviors constructs consisted of metacognitive control strategies, procrastination, and avoidance of help-seeking subscales.

Correlations of subscale constructs revealed multiple statistically significant findings that were consistent with previous research conducted by Artino et al. (2012). As noted in Table 1, all but one of the correlations between constructs were found to have similar associations with respect to the study group's goal orientations and learning behaviors. The lone correlation that failed to meet statistical significance was between avoidance of help-seeking and performance-avoid goal orientation. Within goal structures, only one correlation was identified. Performance-avoid goal structures were positively correlated with performance-approach goal structures ($r = .29$, $p < .01$).

Table 3

Comparison of Correlations and Reliabilities of Current Study & Artino et al. (2012)

Subscale Constructs	C1.		C2.		C3.		C4.		C5.		α	
	1	2	1	2	1	2	1	2	1	2	1	2
C1. Performance-approach	-	-									.73	.78
C2. Mastery goal structure	.09	-.01	-	-							.70	.83
C3. Performance-avoid	**.29****	**.47****	-.13	-.04	-	-					.80	.88
C4. Metacognition	-.02	.07	**.43****	**.26****	.00	-.01	-	-			.81	.82
C5. Procrastination	-.12	.01	**-.23****	**-.16****	.01	.04	**-.35****	**-.12***	-	-	.78	.91
C6. Avoidance help-seeking	.17	.05	**-.23****	**-.24****	.14	.24**	**-.23***	**-.03****	**.28****	**.36****	.70	.84

Note: 1 = current study, 2 = Artino et al. (2012)

$^{*}p < .05$. $^{**}p < .01$.

Between achievement goal structures and learning behaviors, mastery goal structures had multiple correlations, as also noted in previous research. Mastery goal structures were positively correlated with metacognitive control strategies ($r = .426$, $p < .01$), basic skills self-efficacy ($r = .223$, $p < .05$), and advanced skills self-efficacy ($r = .282$, $p < .01$), and were negatively correlated with procrastination ($r = -.234$, $p < .05$) and avoidance of help-seeking ($r = -.232$, $p < .05$).

Within learning behaviors, metacognitive control strategies were negatively correlated with procrastination ($r = -.352$, $p < .05$) and avoidance of help-seeking ($r = -.232$, $p < .05$). Procrastination was positively correlated with avoidance of help-seeking ($r = .282$, $p < .01$).

Between learning behaviors and perceived performance, metacognitive control strategies were positively correlated with both basic skills self-efficacy ($r = .296$, $p < .01$) and advanced skills self-efficacy ($r = .331$, $p < .01$). Avoidance of help-seeking was negatively correlated with basic skills self-efficacy ($r = -.218$, $p < .05$).

Within the perceived performance constructs, basic skills self-efficacy was positively correlated with advanced skills self-efficacy ($r = .633$, $p < .01$)

And lastly, between achievement goal structures and self-efficacy, performance-approach goal structures were positively correlated with advanced skills self-efficacy ($r = .282$, $p < .05$), and mastery goal structures were positively correlated with basic skills self-efficacy ($r = .223$, $p < .05$).

Question 2: Are there differences between early and late-phase clinical students in relation to goal orientation and learning behaviors?

The research questions for this study were to determine if both groups of students had perceptions of mastery goal orientations that were correlated with adaptive learning behaviors and maladaptive learning behaviors, to determine if there were differences between early and late-phase clinical students in relation to goal orientation and learning behaviors, and to determine if there were differences between PA and MD students in self-regulation and goal orientation. The first question, whether both groups of students had perceptions of mastery goal orientations that were correlated with adaptive and maladaptive learning behaviors, was answered within the correlational findings above. To analyze the differences between early and late-phase clinical students and between PA and MD students, independent sample t-tests were performed on the data obtained from the participants.

Data analysis between first- and second-year PA students revealed only one statistically significant finding. Second-year PA students had a slightly higher perception of basic skills self-efficacy ($M = 4.27$, $SD = .42$) than first-year PA students ($M = 4.06$, SD .37), $t(93) = -2.06$, $p = .04$, $d = 0.53$.

Contrary to previous research, MD students did not have a statistically significant change in mastery goal structures from the third to fourth year. However, there was a statistically significant difference in performance-avoid goal structures. An increase was noted

from third-year MD students (M = 2.98, SD = .81) to fourth-year MD students (M = 3.63, SD = .59) $t(93) = -2.78$, $p < .01$, $d = -0.94$ (Table 4).

Table 4

Independent Samples Test of Differences Between Third- and Fourth-year MD students

Constructs	Third-year		Fourth-year		t (93)	p	Cohen's d
	M	SD	M	SD			
Performance-approach	3.68	.58	3.44	.75	1.08	.29	0.36
Mastery goal structure	4.71	.30	4.62	.42	0.73	.47	0.25
Performance-avoid	**2.98**	**.81**	**3.63**	**.59**	**-2.78**	**<.01****	**-0.94**
Metacognition	3.28	.57	3.38	.73	-0.44	.66	-0.15
Procrastination	2.25	.91	2.36	1.01	-0.32	.75	-0.11
Avoidance of help-seeking	1.61	.52	1.62	.40	-0.05	.96	-0.02
Basic skills self-efficacy	4.17	.46	4.15	.57	0.16	.88	0.05
Advanced skills self-efficacy	3.65	.49	3.58	.67	0.33	.74	0.11

$^{*}p < .05$. $^{**}p < .01$.

Analysis of differences between students in their first clinical year of rotations, first-year PA and third-year MD students, revealed four statistically significant differences. The first difference was in performance-approach goal structures, where first-year PA students' responses indicated they were less likely to use performance-approach goal orientation (M = 3.06, SD = .81), than MD students (M = 3.69, SD = .58) $t(93) = 2.74$, $p < .01$, $d = 0.84$. PA student perception of mastery goal structures (M = 4.86, SD = .22) was higher than that of MD students (M = 4.71, SD = .30), $t(93) = -1.970$, P = .05, $d = -0.61$.

Third-year MD students had higher perceptions of their advanced skills self-efficacy (M = 3.65, SD = .49) than that of first-year PA students (M= 3.09, SD = .44), $t(93) = -3.97$, $p < .01$, $d = -0.91$. And lastly, third-year MD students noted that they were less likely to seek help when needed (M = 1.61, SD = .52) compared to first-year PA students (M = 1.32, SD = .34), $t(93) = 2.29$, $p < .01$, $d = 0.71$.

For students in their second year of clinical rotations, only one contrast was statistically significant. Similar to the findings noted above with early-phase students, late-phase MD students, fourth-year, were less likely to seek help ($M = 1.62$, $SD = .40$) than late-phase, second-year, PA students ($M = 1.34$, $SD = .28$), $t(93) = 2.85$, $p < .01$, $d = 0.84$.

Question 3. Are there differences between PA and MD student self-regulation and goal orientations?

In the overall comparison between PA and MD students (Table 5), there were multiple significant findings. As seen in the previous analyses between early- and late-phase students, MD students were more likely to have performance-approach goal structures, while PA students were more likely to have mastery goal structures. Additionally, MD students had higher advanced skills self-efficacy, while PA students noted that they were more likely to seek help when needed ($M = 1.33$, $SD = .31$) than MD students ($M = 1.62$, $SD = .46$), $t(93) = 3.64$, $p < .01$, $d = 0.77$.

Table 5

Independent Samples Test of Differences Between PA and MD Students

Constructs	PA		MD		*t* (93)	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*			
Performance-approach	**3.13**	**.70**	**3.55**	**.68**	**2.84**	**<.01****	**0.60**
Mastery goal structure	**4.84**	**.25**	**4.66**	**.37**	**-2.77**	**<.01****	**-0.59**
Performance-avoid	3.29	.78	3.33	.76	0.26	.80	0.05
Metacognition	3.51	.66	3.33	.66	-1.29	.20	-0.27
Procrastination	2.31	.71	2.31	.95	-0.03	.98	-0.07
Avoidance of help-seeking	**1.33**	**.31**	**1.62**	**.46**	**3.64**	**<.01****	**0.77**
Basic skills self-efficacy	4.16	.51	4.16	.51	0.01	.99	0.00
Advanced skills self-efficacy	**3.30**	**.53**	**3.61**	**.59**	**2.63**	**.01***	**0.55**

$^{*}p < .05$. $^{**}p < .01$.

CHAPTER V

DISCUSSION

This study aimed to examine goal orientation and self-regulation in PA and medical students in the clinical phase of their education and to determine if there are significant differences within and between the two groups. Concerns about non-physician provider autonomy from physician organizations have led to many battles about legislation at the state and federal levels nationwide. Physician organizations argue that PAs do not possess the amount of education required to practice independently. However, multiple studies published by physicians, PAs, and others, have consistently shown that the care provided by PAs is as good and sometimes better than that provided by physicians.

Such changes to a medical environment that has had physicians as the sole diagnosticians and decision-makers in patient care bring questions on how the education and training of these non-physician providers compare to that of physicians. While there are many aspects to consider, one area that has not been adequately explored relates to educational theory, specifically self-regulation and goal orientation. Achievement goal theory and self-regulation theory both play a crucial role in how medical providers learn and master the knowledge and skills that they will use throughout their careers. It is vital that practicing PAs and physicians know when they need to use their resources, such as research, peer advice, or knowledge from previous mistakes in caring for patients (Ericsson, 2015).

Therefore, this research explores how these theories pertain to differences among PA students, MD students, and between PA and MD students. This chapter will analyze the data as

they relate to the research questions and provide interpretations based on the results, compare the results to the current literature, and address any study limitations.

Research Questions

Question 1: Are PA and MD students' perceptions of mastery goal orientation correlated with adaptive learning behaviors and maladaptive behaviors?

The hypothesis for this question was that there would be correlations between these perceptions and behaviors based on previous research in the literature that correlated mastery goal structures positively with adaptive learning behaviors and negatively with maladaptive learning behaviors (Artino et al., 2012). The answers to this question are best explained by the correlation analysis of the constructs of mastery goal orientation, metacognitive control strategies, procrastination, and avoidance of help-seeking. As noted in Artino et al. (2012), the authors found multiple significant correlations to include mastery goal structures positively correlated with metacognition ($r = 0.26$, $p < .01$), negatively correlated with procrastination ($r = -0.16$, $p < .01$), and negatively correlated with avoidance of help-seeking ($r = -0.24$, $p < .01$). They also found that performance-approach goal structures were positively correlated with performance-avoid goal structures ($r = 0.47$, $p < .01$). Additionally, performance-avoid goal structures were positively correlated with help avoidance ($r = 0.24$, $p < .01$), and metacognition measurements were negatively correlated with procrastination ($r = -0.12$, $p < .05$).

Similar to Artino et al. (2012), the findings from this study also demonstrated that mastery goal structures were positively correlated with metacognitive control strategies ($r = .426$, $p < .01$), basic skills self-efficacy ($r = .223$, $p < .05$), and advanced skills self-efficacy ($r = .282$, $p < .01$), and were negatively correlated with procrastination ($r = -.234$, $p < .05$) and

avoidance of help-seeking (r = -.232, p < .05). The only correlation not found in this study that was statistically significant in Artino et al. was between performance-avoid goal structures and avoidance of help-seeking. In the discussion of Artino et al. (2012), it was noted that the fourth-year MD students had already been selected for their residency training positions at the time of the survey. Once MD students have been selected for advanced training in the specialty of their choice, their goal orientations likely change to some degree as the rigorous selection process has ended (Benson et al., 2015). In the current study, fourth-year MD students had not been matched to the residencies to which they applied, therefore, they maintained a higher performance-avoid goal orientation.

Findings from this study add value to previous studies based on similarities of the correlations and reliability testing. Conversely, results from previous research help to add further insight into the measures that the current study could not obtain, such as the participants' grade-point average (GPA) and clerkship ratings by preceptors. Artino et al. (2012) assessed the performance of MD students based on GPA and clerkship ratings by preceptors of MD students' performance. The study found that students' perception of performance-approach goal structures positively correlated with GPA, which stated otherwise; students with higher GPAs focused on grades and therefore tried to achieve higher GPAs. Artino et al. (2012) also found that performance-avoid goal structure analysis was negatively correlated with clinical performance based on preceptors' evaluations. Therefore, students with a higher measure of performance-avoid goal orientation were more likely to score lower in the eyes of their preceptors. Students that tended to avoid seeking help were also noted to have lower GPAs, had lower ratings from the clinical preceptors, and were more likely to need remedial instruction during their education.

Question 2: Are there differences between early and late-phase clinical students in relation to goal orientation and learning behaviors?

The hypothesis for this question was that there would be a decrease in performance-avoid goal structures between the early-phase and late-phase students, as demonstrated in the literature. (Artino et al., 2012). To answer this question, analyses were performed to compare first- and second-year PA students and third- and fourth-year MD students. Further analysis of early- and late-phase PA and MD students, respectively, in their programs will be explored in the last question.

The comparison of first- and second-year PA students revealed little statistically significant findings. As suggested by previous research (Artino et al., 2012), there was not a significant difference between first-year PA (M = 3.12, SD = .84) and second-year PA (M = 3.47, SD = .60) students in the performance-avoid construct $t(93) = -1.84$, $p = .07$. However, this was the closest to statistically significant compared to all the other non-significant constructs. The only significant finding amongst PA students was in the construct of basic skills self-efficacy, where first-year PA students (M = 4.06, SD = .37) suggested they had less confidence in basic medical skills compared to second-year PA students (M = 4.27, SD = .42), $t(93)$ -2.06, $p < .05$, d = -0.53).

As for MD students, the study reflected similar findings in the previous literature in the performance-approach goal orientation construct. Third-year MD students (M = 2.98, SD = .81) had decreased perceptions of performance-approached goal orientation compared to that of fourth-year MD students (M = 3.63, SD = .59) $t(93) = -2.28$, $p < .01$, d = -0.94.

Achievement goal theory (Zimmerman & Schunk, 2008) helps to explain why individuals put in the effort to learn the essentials of their discipline. This theory suggests that

students are either primarily master goal-orientated, performance-approach goal-orientated, or performance-avoidant goal-orientated. Mastery goal-orientated students tend to exhibit more desirable attributes in their approach to learning. They tend to use what are considered desirable means of achieving their goals, such as employing metacognition and avoiding traits such as procrastination and avoidance of help-seeking.

Garino (2019), in a mixed methods study, noted that second-year PA students and third- and fourth-year MD students that were more willing to accept feedback from their preceptors tended to have higher levels of mastery goal orientation than those that were not as receptive. The current research supports the claims that students with higher scores in master goal orientation employ these more positive attributes and suppress the more negative qualities such as avoidance of help-seeking and procrastination.

In the context of future practice, these attributes could likely provide the basis for a more thorough investigation of patient complaints, physical examinations, consideration of diagnostics, and diagnoses that will lead to improved and safer care. Performance-approach and performance-avoid goal orientations in the clinical context of a practicing PA or MD would not likely be beneficial as the appearance of their abilities or hiding their deficiencies would only benefit them and not their patients. While it is still desirable to be considered a competent and valued member of the medical care team, the goal of patient care is, first and foremost, to do no harm. To achieve this, clinicians must consciously focus more on self-improvement and less on their appearance of competence to others. Therefore, educators of these future clinicians must continue to maintain learning environments that encourage students to focus more on mastery goal structures and less on performance goal structures.

Question 3. Are there differences between PA and MD student self-regulation and goal orientations?

Despite significant research on many aspects of self-regulation and goal orientation of MD students, the literature lacks relatable findings about PA students. As mentioned previously, Garino (2019) conducted a mixed methods study to explore how second-year PA students and third and fourth-year MD students responded to and used preceptor feedback during the clinical rotations. While this study did not directly address differences between PA and MD students, it does help to explain the relationships between goal orientation and the student's ability to work within the medical team. The analysis of the quantitative and qualitative portions of the study revealed findings similar to Artino et al. (2012) from the aspects of Achievement Goal Theory. The current study adds to the literature by examining the learning behaviors of both PA and MD students and addressing the potential similarities and differences and why they may exist.

The hypothesis between PA and MD students was that there would be differences in that MD students would be more focused on not appearing incompetent (performance-avoid) and less likely to ask for help than PA students. This hypothesis was based on assertions noted in the literature that MD students have more to prove to others as they complete medical school and await a match to their desired residencies where they further their training with more specialized skills (Benson et al., 2015). Conversely, PA students will generally be moving into the workforce. PA education emphasizes collaborative practice, and new PAs need to rely on colleagues to help them through their initial years of practice. While this is not to say MD students and new physicians do not rely on the same means of self and clinical improvement, asking for help and knowing your limitations are vital for PAs to practice. Goldgar et al. (2015)

noted that within the core competencies for PA students, realistic self-appraisal and situational judgment were two of the characteristics vital to PA students as they complete their education and transition into clinical practice. While in clinical practice, ongoing professional development and interprofessional collaborative practice are also core and crosscutting domains.

To further discuss the differences between PA and MD students, goal structures and learning behaviors that were found to have statistical significance in this study will be reviewed individually.

Avoidance of help-seeking

The most significant difference found in the study suggested that PA students (M = 1.33, SD = .31) were more likely to ask for help compared to MD students (M = 1.62, SD = .46) $t(93) = 3.64$, $p < .001$, $d = 0.77$. This was also true when comparing second-year PA and fourth-year MD students who will soon enter advanced training or clinical practice, $t(93) = 2.85$, $p < .01$, $d = 0.84$. Given the significance level and large effect size, this notable finding is significant to the literature. PAs entering practice after their education must rely on resources, such as literature, physicians, and other colleagues, to ensure that they are improving their clinical skills and in the practice of medicine. Compared to the early years of a PA's practice, physicians are still within a structured learning environment in the following few years after completing medical school. Critics of non-physician providers that practice independently stress this in their arguments that non-physician providers such as PAs are not trained to the level of physicians. While the organization of advanced training/residency is undoubtedly more structured than that of new PA entering practice, the finding that PA students are more likely to ask for help when needed versus MD students gives us a greater sense that while they are not

in this more structured environment, they are still progressing in advancing their ability to practice medicine. Avoidance of help-seeking is not a measure of competence or an excessive need for help from others; it is behavior that suggests that students, and possibly future clinicians, avoid seeking help even when it is needed (Pajares et al. (2004).

Sawatsky et al. (2022) studied the relationship between autonomy and supervision in the training of physicians. Proponents of increasing supervision propose that physician trainees make too many mistakes and that their attending preceptors could catch and ameliorate these errors. Therefore, an increase in supervision subsequently results in a decrease in autonomy. Reductions in autonomy can lead to a decline in the ability of the new physicians to make decisions and internalize why those decisions were made and the outcomes associated with them and allow for further self-regulating behaviors. The authors note that autonomy and supervision are typically competing capacities but should have more of a dynamic relationship with balances that allow for growth and increased patient safety. Since physicians complete advanced training during the residency, they focus on their chosen specialty, building on their education and training from medical school. On the other hand, PAs also obtain further training, albeit on-the-job training, while working alongside physicians and other advanced medical providers.

As mentioned previously, numerous studies in the literature examine the outcomes of patients being treated by PAs, physicians, and other medical providers (Kurtzman & Barnow, 2017) (Smith et al., 2019). Therefore, it can be suggested that the self-regulating behaviors that PAs obtain during their education transfer into the clinical world after their graduation. As seen in the data analysis, PA students maintain a low level of avoidance of help-seeking tendencies, which they continue to use in their clinical practices.

Performance-approach goal structures

In the performance-approach goal structure construct, MD students had a higher tendency for the need to appear competent in front of others compared to PA students (M = 3.13, SD = .70) $t(93) = 2.84$, p <.01, d = 0.60. As mentioned previously in the discussion, MD students suggested in their aggregate responses that there is a greater need for the appearance of competence in the eyes of their preceptors. This finding could be explained by the competition for advanced training slots in their desired specialties (Benson et al., 2015). In contrast, though MD students still have high levels of mastery goal orientation, the data suggest that PA students are less likely to focus on the appearance of competency in front of others and lean more toward mastery goal orientations.

Mastery goal structures

As noted in the previous section, PA students had higher perceptions of mastery goal structures (M = 4.84, SD = .25) than that of MD students (M = 4.66, SD = .37) $t(93) = -2.77$, p < .01, d = 0.60. This difference between the two groups likely originates in the performance-approach goal orientation, as mentioned above. While MD students had high levels measured in the mastery goal structure construct, the competing focus on performance-approach goal orientation likely takes from some of the more desirable perceptions and attributes.

Berkhout et al. (2017) noted that self-regulated learning behaviors and the context in which they were observed were closely related and likely beneficial to help propagate other self-regulating behaviors required of students in their future practices. This assertion likely holds true in the context of both PA and MD students, but in the case of this study, PAs had a higher level of focus on mastery goal structures. It is imperative that the educators of these future medical professionals help students to adopt these behaviors early on in their education

and continue to reinforce these meaningful practices.

Implications

Achievement goal theory (Elliot, 1999) and self-regulation both play a vital role in how medical providers learn and master the knowledge and skills that they will use throughout their careers. It is crucial that practicing PAs or physicians know when they need to use their resources, such as research, peer advice, or knowledge from previous mistakes in caring for patients (Ericsson, 2015). Achievement goal theory helps to explain these behaviors and why individuals attempt to gain knowledge. With a significant amount of controversy surrounding non-physician providers practicing independently, more research on the differences between physicians and non-physician providers is needed to help further evaluate the debate.

The findings of this study may translate into the future clinical practices of PA and MD students and their abilities to continue to self-regulate and ensure the best outcomes and patient safety possible. While some of the differences between PA and MD students found in this study were significant, it is evident that there are many similarities between the two groups such as the ability to maintain healthy goal orientations and self-regulating behaviors. Future practitioners must view their practices through the lens of a lifetime learner by having the ability to consider their shortcomings and improve their clinical skills through self-reflection, focusing on improvement, and continuing education.

Educators of these future professionals should use best practices of fostering adaptive goal structures and learning behaviors. Previous studies have shown that these attributes and behaviors by students tend to continue throughout their education and likely into their future practices. While this study aimed to compare MD and PA students, the results show that both groups have tendencies that may lead them toward maladaptive behaviors.

Probably the most critical finding in this research, as it relates to the controversies with PA autonomy, is that PA students were shown to adopt high levels of adaptive self-regulatory behaviors, such as asking for help when necessary and a focus on mastery goal orientations during their clinical training. While it does not close the book on the subject, it provides evidence of how PA training prepares PAs to think, function safely, and succeed when practicing medicine.

Limitations

As with any survey-based research, there is the concern of social desirability in answering questions by participants. However, consistency with previous research in the findings was promising. Other limitations of this study include a cross-sectional design, participants from a single institution, and the lack of longitudinal data. This would be of benefit as a broader pool and more data would increase the validity and generalizability of the findings.

As seen in the previous research, more outcome measures would have also helped to increase the validity. However, this was not possible given the need for anonymity and the unavailability of outcome measures such as GPA and scores from clinical preceptor evaluations from the MD student participants.

The MD program at the institution, like many, was affected by the pandemic in the first year of the late-phase students (fourth-year MD students). Much of the first year of their didactic studies were forced online, which was not a part of the primary design of the curriculum. There were no significant effects on the curriculum for the third-year MD students. However, some clinical timing curricular changes were implemented between the third- and fourth-year MD students' curriculum. The effects of these changes may have some

implications on this group of students; however, the timing of the survey deployment in relation to early- and late-phase students was as consistent as possible, and any potential issues the pandemic may have caused did not seem to have significant effects when comparing the results to previous research.

The PA program participants in the study did not have any significant impacts from the pandemic. All aspects of the designed curriculum were consistent with the pre-pandemic format.

Future Research

Future research in this area would be helpful to include more outcome measures as described in the limitations and add a longitudinal study that includes both students and recent graduates in clinical practice from a PA perspective and physicians in their residency/specialized postgraduate training.

The main goal of this research was to address some of the unanswered questions related to the debate on non-physician practitioners and increased autonomy. While the most appropriate and accessible group to begin this research was with students, exploring the progression, or regression, of changes in goal orientations and learning behaviors of practicing professionals would be valuable.

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APPENDICES

APPENDIX A

Copy of Qualtrics Survey

CONSENT FORM

Title of Project: Self-Regulation and Goal Orientation in Physician Assistant and Medical Students

Principal Investigator: Jay Metzger, (701) 777-3414, jay.metzger@und.edu

Advisor: Dr. Virginia Clinton-Lisell, (701) 777-5793, virginia.clinton@und.edu

Purpose of the Study: This research aims to evaluate self-regulation and learning in medical and physician assistant students while completing their clinical rotations.

- **Procedures to be followed:** If you decide to participate in this research study, you will open the survey link provided in the email and complete the survey. The survey consists of basic demographic information and questions related to your clinical rotations/clerkships and how you learn while participating. The survey will take approximately 5-10 minutes to complete. There are 43 multiple-choice questions. If you do not wish to answer a question, you can skip over the question.
- **Risks:** There are no risks in participating in this research beyond those experienced in everyday life.
- **Benefits**: It is not expected that you will personally benefit from this research. However, the results may give educators more information on how students like you learn and lead to better practices in the future.
- **Statement of Confidentiality:** The survey will record all responses anonymously. No information identifying you will be included if this research is published since your name is not linked to your responses. If you choose to enter the raffle for the stethoscope and gift cards, your information will not be recorded as part of the data analysis and will be kept separate through a different link. All survey responses received will be treated confidentially and stored on a secure server.
- **Right to Ask Questions:** If you later have questions, concerns, or complaints about the research, please contact Jay Metzger at (701) 777-3414 or email jay.metzger@und.edu or Dr. Virginia Clinton-Lisell at (701) 777-5793 or email virginia.clinton@und.edu. If you have questions regarding your rights as a research subject, complaints, or concerns about the research, you may contact the University of North Dakota Institutional Review Board at (701) 777- 4279 or UND.irb@UND.edu.
- **Compensation:** You can enter a drawing for a digital stethoscope and one of two $50 Visa gift cards at the end of the survey. You will not receive any other compensation for your participation. If you enter the

drawing, your personal information will not be linked to your responses from the survey. Only one entry to the drawing per person.

Voluntary Participation: You do not have to participate in this research. You can stop your participation at any time. You may refuse to participate or choose to discontinue participation at any time without losing any benefits to which you are otherwise entitled. You must be 18 years of age or older to participate in this research study. ***Completing the survey implies that you have read the information in this form and consent to participate in the research.***

Which program are you a student in?

- ○ Medical Doctor
- ○ PA

Which year are you in for your program?

- ○ First Year
- ○ Second Year
- ○ Third Year
- ○ Fourth Year

What is your age?

[ ]

What is your gender?

- ○ Female
- ○ Male
- ○ [ ] I prefer to specify another:
- ○ I prefer not to answer

The following items address your rotations/clerkships and the work you do in them.

In your rotations/clerkships…

	Extremely **UNTRUE**	Somewhat UNTRUE	Neutral	Somewhat TRUE	Extremely **TRUE**
Getting good grades is the main goal.	○	○	○	○	○
Trying hard is very important.	○	○	○	○	○
Showing others that you are not bad at clinical work is really important.	○	○	○	○	○
It's important to understand the work, not just memorize facts.	○	○	○	○	○
Being right is critically important.	○	○	○	○	○
One of the main goals is to avoid looking like you are struggling to do the work.	○	○	○	○	○
Learning new skills is very important.	○	○	○	○	○
It's important that you don't make mistakes in front of everyone.	○	○	○	○	○
It's important not to do worse than other students.	○	○	○	○	○

t

	Extremely **UNTRUE**	Somewhat UNTRUE	Neu ral	Somewhat TRUE	Extremely **TRUE**
It's very important not to look incompetent in front of others.	○	○	○	○	○

	Extremely **UNTRUE**	Somewhat UNTRUE	Neutral	Somewhat TRUE	Extremely **TRUE**
Getting high exam scores is extremely important.	○	○	○	○	○
Really understanding a patient's clinical problems is the main goal.	○	○	○	○	○
How much you improve is really important.	○	○	○	○	○

For each item, select the response that best reflects how often you perform the various behaviors.

In your rotations/clerkships, how often do you…

	Almost **NEVER**	Once in a while	Sometimes	Often	Almost **ALL THE TIME**
Change the way you study, if the clinical material is difficult to understand?	○	○	○	○	○
Postpone doing clerkship readings until the last minute?	○	○	○	○	○
Try to determine which clinical concepts you don't understand well?	○	○	○	○	○
Prefer to skip a clinical task rather than ask for assistance?	○	○	○	○	○
Set goals for yourself in order to direct your activities?	○	○	○	○	○

	Almost **NEVER**	Once in a whil e	Some imes	Often	Almost **ALL THE TIME**
Delay studying for your exams, even when it's important?	○	○	○	○	○

	Almost **NEVER**	Once in a while	Sometimes	Often	Almost **ALL THE TIME**
Make sure you sort out any issues before proceeding to the next activity?	○	○	○	○	○
Pause to keep track of how much of the clinical work you are understanding?	○	○	○	○	○
Avoid asking questions, even if you don't understand something?	○	○	○	○	○
Settle for doing worse on an assignment you couldn't finish on your own, rather than ask for help?	○	○	○	○	○
Stop once in a while to reflect on what you have learned?	○	○	○	○	○
Avoid asking for help, even when the clinical workload is too hard to manage on your own?	○	○	○	○	○

	Almost **NEVER**	Once in a while	Sometimes	Often	Almost **ALL THE TIME**
Find excuses for not starting your clerkship work?	○	○	○	○	○
Put off getting started on the readings for your rotations/clerkships?	○	○	○	○	○
Ask yourself questions to make sure you understand the clinical problems you are treating?	○	○	○	○	○

	Almost **NEVER**	Once in a whil e	Some imes	Often	Almost **ALL THE TIME**
Chart something in a patient's record you are unsure of, rather than ask for help?	○	○	○	○	○
Try to think through each clinical topic and decide what you are supposed to learn from it, rather than just reading it over?	○	○	○	○	○

For each item, select the response that best reflects your level of confidence.

At this point in your medical training, how confident are you that you can…

	Not at all confident	Slightly confident	Somewhat confident	Quite confident	**Extremely confident**
Apply knowledge of normal function to each of the major organ systems?	○	○	○	○	○
Evaluate evidence from scientific studies relevant to your patients' health problems?	○	○	○	○	○
Work effectively with other healthcare professionals to provide high-quality patient care?	○	○	○	○	○
Use effective listening skills when interacting with a patient?	○	○	○	○	○
Develop an appropriate differential diagnosis?	○	○	○	○	○
	Not at all confident	Slightly confident	Somewhat confident	Quite confident	**Extremely confident**

	Not at all confident	Slightly confident	Somewhat confident	Quite confident	**Extremely confident**
Accurately gather essential information from a patient?	○	○	○	○	○
Perform a thorough physical exam?	○	○	○	○	○
Generate a patient-specific treatment plan?	○	○	○	○	○
Balance professional responsibilities with personal responsibilities?	○	○	○	○	○
Demonstrate caring when counseling a patient?	○	○	○	○	○

APPENDIX B

Permission to Use Survey

From: Artino, Anthony <aartino@email.gwu.edu>
Sent: Wednesday, December 14, 2022 7:27 AM
To: Metzger, Jay
Subject: Re: Survey request
Attachments: Medical Education Survey of Self-Regulated Learning_Clinical.docx; Medical Education Survey of Self-Regulated Learning_Preclinical.docx; Medical Education Survey of Self- Regulated Learning Item Key.docx

Good day Jay,

Sure, happy to share. Please just cite

our work accordingly. See attached.

-Tony

On Tue, Dec 13, 2022 at 8:13 PM <jay.metzger@und.edu> wrote:

Warning: This email originated from a web form available on this web page: https://apps.smhs.gwu.edu/smhs/facultydirectory/. We are not able to verify the sender's email address.

Contact SMHS Faculty member	
* From *(Use Email)*:	jay.metzger@und.edu
* To:	**Anthony Artino**
* Subject:	
Survey request	
* Message:	
Hello Dr. Artino, I am pursuing my PhD in education research and came across your study from 2012 titled Achievement Goal Structures and Self-Regulated Learning Relationships and Changes in Medical School." I plan on studying a similar concept in PA students and was hoping that you would share the survey you used for this study. Thank you for your consideration. Jay Metzger	

Anthony R. Artino, Jr., Ph.D.
School of Medicine & Health Sciences The George Washington University

APPENDIX C

Item Key

Survey of PA and Medical Student

Confidence, Academic Beliefs, and Behaviors

Adapted from Artino, A., et al., (2012). Achievement Goal Structures and Self-Regulated Learning: Relationships and Changes in Medical School. *Academic Medicine 87*(10):p 1375-1381. DOI:10.1097/ACM.0b013e3182676b55

Demographics:

1. Which program are you a student in?
    a. Medical Doctor
    b. PA
2. Which year are you in for your program?
    a. PAs
        i. First year
        ii. Second year
    b. Med students
        i. Third year
        ii. Fourth year
3. What is your gender?
4. What is your current age?

SECTION I – Learning Environment

Preface: *"The following items address your rotations/clerkships and the work you do in them. For each item, select the response that best reflects the learning environment in your rotations/clerkships."*

Extremely Untrue	*Somewhat Untrue*	*Neutral*	*Somewhat True*	*Extremely True*

In your rotations/clerkships…

C1. Performance-approach goal structure

Q1/pap_1. Getting good grades is the main goal.

Q2/pap_2. Being right is critically important.

Q3pap_3. Getting high exam scores is extremely important.

C2. Mastery goal structure

Q4/mast_1. Trying hard is very important.

Q5/mast_2. It's important to understand the work, not just memorize facts.

Q6/mast_3. Learning new skills is very important.

Q7/mast_4. Really understanding a patient's clinical problems is the main goal.

Q8. /mast_5 How much you improve is really important.

C3. Performance-avoid goal structure

Q9/pav_1. Showing others that you are not bad at clinical work is really important.

Q10/pav_2. One of the main goals is to avoid looking like you are struggling to do the work.

Q11/pav_3. It's important that you don't make mistakes in front of everyone.

Q12/pav_4. It's important not to do worse than other students.

Q13/pav_5. It's very important not to look incompetent in front of others.

SECTION II – Learning Behaviors

Preface: *"The following items address various learning behaviors you may or may not use in your rotations/clerkships. For each item, select the response that best reflects how often you perform the behavior."*

Almost Never	*Once in a While*	*Sometimes*	*Often*	*Almost All the Time*

In your rotations/clerkships, how often do you…

C4. Metacognition

Q14/meta_1. Change the way you study, if the clinical material is difficult to understand?

Q15/meta_2. Try to determine which clinical concepts you don't understand well?

Q16/meta_3. Set goals for yourself in order to direct your activities?

Q18/meta_5. Pause to keep track of how much of the clinical work you are understanding?

Q19/meta_6. Stop once in a while to reflect on what you have learned?

Q20/meta_7. Ask yourself questions to make sure you understand the clinical problems you are treating?

Q21/meta_8. Try to think through each clinical topic and decide what you are supposed to learn from it.

C5. Procrastination

Q22/proc_1. Postpone doing clerkship readings until the last minute?

Q23/proc_2. Delay studying for your exams, even when it's important?

Q24/proc_3. Find excuses for not starting your clerkship work?

Q25/proc_4. Put off getting started on the readings for your rotations/clerkships?

Q26/proc_5. Prefer to skip a clinical task rather than ask for assistance?

C6. Avoidance of help seeking

Q27/ahs_1. Avoid asking questions, even if you don't understand something?

Q28/ahs_2. Settle for doing worse on an assignment you couldn't finish on your own, rather than ask for help?

Q29/ahs_3. Avoid asking for help, even when the clinical workload is too hard to manage on your own?

SECTION I – Self-Efficacy

Preface: *"The following items address <u>your confidence</u> in relation to your medical knowledge and skills. For each item, select the response that best reflects your level of confidence."*

Not at All Confident 1	*Slightly Confident 2*	*Somewhat Confident 3*	*Quite Confident 4*	*Extremely Confident 5*

At this point in your medical training, how confident are you that you can…

C7. Basic skills self-efficacy

Q31/CON_1. Apply knowledge of normal function to each of the major organ systems?

Q32/CON_3. Work effectively with other healthcare professionals to provide high-quality patient care?

Q33/CON_4. Use effective listening skills when interacting with a patient?

Q34/CON_6. Accurately gather essential information from a patient?

Q35/CON_7. Perform a thorough physical exam?

Q36/CON_10. Demonstrate caring when counseling a patient?

C8. Advanced skills self-efficacy

Q37/CON_2. Evaluate evidence from scientific studies relevant to your patients' health problems?

Q38/CON_5. Develop an appropriate differential diagnosis?

Q40/CON_8. Generate a patient-specific treatment plan?

APPENDIX D

Institutional Review Board Approval

Division of Research & Economic Development
Office of Research Compliance & Ethics

Principal Investigator: Virginia Elizabeth Clinton-Lisell

Protocol Title: Self-Regulation and Goal Orientation in Physician Assistant and Medical Students

Protocol Number: IRB0005582

Protocol Review Level: Exempt 2

Approval Date: 03/01/2023

Expiration Date: 02/28/2026

The application form and all included documentation for the above-referenced project have been
reviewed and approved via the procedures of the University of North Dakota Institutional Review
Board.

If you need to make changes to your research, you must submit an amendment to the IRB for review and approval. No changes to approved research may take place without prior IRB approval.
This project has been approved for 3 years, as permitted by UND IRB policies for exempt research. You have approval for this project through the above-listed expiration date. When this
research is completed, please submit a termination request to the IRB.

Sincerely,
Michelle L. Bowles, M.P.A., CIP
she/her/hers

Director of Research Assurance & Ethics
Office of Research Compliance & Ethics
Division of Research & Economic Development
University of North Dakota
Technology Accelerator, Suite 2050
4201 James Ray Drive Stop 7134
Grand Forks, ND 58202-7134
O: 701.777.4279
Michelle.Bowles@UND.edu

APPENDIX E

Informed Consent

Title of Project: Self-Regulation and Goal Orientation in Physician Assistant and Medical Students
Principal Investigator: Jay Metzger, (701) 777-3414, jay.metzger@und.edu

Advisor: Dr. Virginia Clinton-Lisell, (701) 777-5793, virginia.clinton@und.edu

Purpose of the Study:
The purpose of this research is to evaluate self-regulation and learning in medical and physician assistant students while completing their clinical rotations.

Procedures to be followed:
If you decide to take part in this research study, you will open the survey link that is provided in the email and complete the survey. The survey consists of basic demographic information and then questions related to your clinical rotations/clerkships and how you learn while participating in them.

The survey will take approximately 5-10 minutes to complete. There are 43 multiple choice questions. If you do not wish to answer a question, you are able to skip over the question.

Risks: There are no risks in participating in this research beyond those experienced in everyday life.

Benefits:
It is not expected that you will personally benefit from this research. However, the results may give educators more information on how students like you learn and lead to better practices in the future.

Statement of Confidentiality:
The survey will record all responses anonymously. If this research is published, no information that would identify you will be included since your name is not linked to your responses. If you choose to enter the raffle for the stethoscope and gift cards, your information will not be recorded as part of the data analysis and will be kept separate through a different link.

All survey responses that we receive will be treated confidentially and stored on a secure server.

Right to Ask Questions:
If you later have questions, concerns, or complaints about the research please contact Jay Metzger at jay.metzger@und.edu, or Dr. Virginia Clinton-Lisell, (701) 777-5793,

virginia.clinton@und.edu.

If you have questions regarding your rights as a research subject, complaints, or concerns about the research you may contact the University of North Dakota Institutional Review Board at (701) 777-4279 or UND.irb@UND.edu.

Compensation:
You have the option of entering a drawing for a digital stethoscope and one of two $50 Visa gift cards at the end of the survey. You will not receive any other compensation for your participation. If you choose to enter the drawing your personal information will not be linked to your responses on the survey. Only one entry to the drawing per person.

Voluntary Participation:
You do not have to participate in this research. You can stop your participation at any time. You may refuse to participate or choose to discontinue participation at any time without losing any benefits to which you are otherwise entitled. You must be 18 years of age older to participate in this research study.

Completion the survey implies that you have read the information in this form and consent to participate in the research.

Thank you!

APPENDIX F

Descriptive Statistics of Survey Questions by Construct

Descriptive Statistics of Survey Questions by Construct

	N	*M*	*SD*	Skewness	Kurtosis
C1. Performance-approach goal structure					
Q1. Getting good grades is the main goal.	95	3.66	0.87	-0.96	1.43
Q2. Being right is critically important.	95	2.83	0.77	-0.14	-0.45
Q3. Getting high exam scores is extremely important.	95	3.38	1.01	-0.19	-0.71
C2. Mastery goal structure					
Q4. Trying hard is very important.	95	4.73	0.47	-1.34	0.57
Q5. It's important to understand the work, not just memorize facts.	95	4.78	0.42	-1.37	-0.14
Q6. Learning new skills is very important.	95	4.84	0.37	-1.91	1.67
Q7. Really understanding a patient's clinical problems is the main goal.	95	4.71	0.52	-2.03	6.01
Q8. How much you improve is really important.	95	4.81	0.47	-1.14	0.13
C3. Performance-avoid goal structure					
Q9. Showing others that you are not bad at clinical work is really important.	95	4.17	0.74	-0.77	0.72
Q10. One of the main goals is to avoid looking like you are struggling to do the work.	95	2.86	1.04	-0.01	-0.68
Q11. It's important that you don't make mistakes in front of everyone.	95	2.62	1.06	0.27	-0.97
Q12. It's important not to do worse than other students.	95	3.20	1.18	-0.48	-0.90
Q13. It's very important not to look incompetent in front of others.	95	3.67	0.94	-0.64	-0.13
C4. Metacognition					
Q14. Change the way you study, if the clinical material is difficult to understand?	95	3.21	0.94	-0.36	-0.29
Q15. Try to determine which clinical concepts you don't understand well?	95	3.75	0.81	-.036	-0.22
Q16. Set goals for yourself in order to direct your activities?	95	3.69	1.03	-0.42	-0.46
Q18. Pause to keep track of how much of the clinical work you are understanding?	95	3.08	1.05	-0.06	-0.79

Q19. Stop once in a while to reflect on what you have learned?	95	3.39	0.90	-0.33	-0.13
Q20. Ask yourself questions to make sure you understand the clinical problems you are treating?	95	3.49	0.94	-0.37	-0.19
Q21. Try to think through each clinical topic and decide what you are supposed to learn from it, rather than j	95	3.49	1.04	-.65	-.01
C5. Procrastination					
Q22. Postpone doing clerkship readings until the last minute?	95	2.76	1.09	0.30	-0.45
Q23. Delay studying for your exams, even when it's important?	95	2.39	1.10	0.34	-0.67
Q24. Find excuses for not starting your clerkship work?	95	1.75	0.86	0.82	-0.36
Q25. Put off getting started on the readings for your rotations/clerkships?	95	2.35	1.04	0.48	-0.48
Q26. Prefer to skip a clinical task rather than ask for assistance?	95	1.29	0.48	1.21	0.17
C6. Avoidance of help-seeking					
Q27. Avoid asking questions, even if you don't understand something?	95	1.53	0.58	0.56	-0.63
Q28. Settle for doing worse on an assignment you couldn't finish on your own, rather than ask for help?	95	1.47	0.67	1.09	0.01
Q29. Avoid asking for help, even when the clinical workload is too hard to manage on your own?	95	1.66	0.68	0.53	-0.74
Q30. Chart something in a patient's record you are unsure of, rather than ask for help?	95	1.19	0.39	1.61	0.61
C7. Basic skills self-efficacy					
Q31. Apply knowledge of normal function to each of the major organ systems?	95	3.62	0.70	0.12	-0.30
Q32. Work effectively with other healthcare professionals to provide high-quality patient care?	95	4.34	0.68	-0.03	-0.74
Q33. Use effective listening skills when interacting with a patient?	95	4.57	0.60	-0.53	0.11
Q34. Accurately gather essential information from a patient?	95	4.04	0.60	-1.04	0.99

Q35. Perform a thorough physical exam?	95	3.89	0.75	0.41	-0.51
Q36. Demonstrate caring when counseling a patient?	95	4.51	0.63	-0.92	-0.19
C8. Advanced skills self-efficacy					
Q37. Evaluate evidence from scientific studies relevant to your patients' health problems?	95	3.53	0.89	-0.13	-0.24
Q38. Develop an appropriate differential diagnosis?	95	3.42	0.66	0.24	0.03
Q40. Generate a patient-specific treatment plan?	95	3.29	0.68	0.17	-0.02

APPENDIX G

Confirmatory Factor Analysis of Survey Items

Rotated Factor Matrix[a]

	Factor										
	1	2	3	4	5	6	7	8	9	10	11
meta_7 Ask yourself questions to make sure you understand the clinical problems you are treating?	.793										
meta_2 Try to determine which clinical concepts you don't understand well?	.676										
meta_6 Stop once in a while to reflect on what you have learned?	.619										
meta_8 Try to think through each clinical topic and decide what you are supposed to learn from it, rather than j	.617										
meta_5 Pause to keep track of how much of the clinical work you are understanding?	.532										
meta_3 Set goals for yourself in order to direct your activities?	.478										

meta_1 Change the way you study, if the clinical material is difficult to understand?	.409		
CON_8 Generate a patient-specific treatment plan?		.669	
CON_7 Perform a thorough physical exam?		.637	
CON_2 Evaluate evidence from scientific studies relevant to your patients' health problems?		.561	
CON_5 Develop an appropriate differential diagnosis?		.525	
CON_6 Accurately gather essential information from a patient?		.473	
CON_1 Apply knowledge of normal function to each of the major organ systems?		.471	.346
CON_4 Use effective listening skills when interacting with a patient?		.430	.603

CON_3 Work effectively with other healthcare professionals to provide high-quality patient care?	.430			.596
CON_10 Demonstrate caring when counseling a patient?				.615
pav_5 It's very important not to look incompetent in front of others.		.779		
pav_4 It's important not to do worse than other students.		.718		
pav_3 It's important that you don't make mistakes in front of everyone.		.699		
pav_2 One of the main goals is to avoid looking like you are struggling to do the work.		.627		
pav_1 Showing others that you are not bad at clinical work is really important.		.550		
proc_4 Put off getting started on the readings for your rotations/clerkships ?			.884	

proc_1 Postpone doing clerkship readings until the last minute?	.736				
proc_2 Delay studying for your exams, even when it's important?	.591				
proc_3 Find excuses for not starting your clerkship work?	.481				
mast_5 How much you improve is really important.		.787			
mast_4 Really understanding a patient's clinical problems is the main goal.		.754			
mast_3 Learning new skills is very important.		.535			
mast_2 It's important to understand the work, not just memorize facts.		.525			
mast_1 Trying hard is very important.		.120		.620	
pap_3 Getting high exam scores is extremely important.			.903		
pap_1 Getting good grades is the main goal.			.611		
pap_2 Being right is critically important.			.481		.343

ahs_5 Chart something in a patient's record you are unsure of, rather than ask for help?							.672				
ahs_3 Settle for doing worse on an assignment you couldn't finish on your own, rather than ask for help?							.625				
ahs_4 Avoid asking for help, even when the clinical workload is too hard to manage on your own?							.527				
ahs_1 Prefer to skip a clinical task rather than ask for assistance?							.491				
ahs_2 Avoid asking questions, even if you don't understand something?							.447				.329
Eigenvalue	6.18	3.95	2.97	2.39	2.23	1.99	1.56	1.31	1.19	1.09	1.02
% of Variance	16.27	10.40	7.82	6.28	5.58	5.23	4.09	3.45	3.13	2.89	2.69
Cumulative variance	16.27	26.68	34.50	40.78	46.64	51.87	55.96	59.40	62.53	65.42	68.11

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 9 iterations.