In Their Own Words:

A Comparison of Medical School Applications in Low and Exceptional Performers

by

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DEDICATION

This thesis is dedicated to all the teachers that have made an impact on me throughout my life and my career, including my mom and my best friend, Mary.

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ABSTRACT

In Their Own Words:

A Comparison of Medical School Application in Low and Exceptional Performers

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Thesis Advisors: Dr. Yating Teng, Assistant Professor of Medicine, Center for Health Professions Education; Dr. Steven Durning, Professor of Medicine, Director, Center for Health Professions Education

Introduction: Current medical school admissions processes are unable to consistently predict which applicants will excel and which will struggle through the four years of medical school. Previous research has assessed whether standardized test scores, grade point averages, or letters of recommendation can portend success, but an applicant's description of their past experiences and extracurricular activities has not been well studied. The purpose of this research was to determine if exceptional and low performing medical students differed in how they wrote about themselves and their experiences in their medical school applications. This could be useful to admissions committees when making selection decisions.

Methods: A constant comparative thematic analysis was completed in the applications of low performing medical students using an a priori thematic framework developed inductively in the applications of exceptional performing medical students. New themes were also assessed in low performer applications. Low performers were defined as those students who were referred to the Student Promotions Committee where an administrative decision was made. Exceptional performers were defined by their induction into both the Alpha Omega Alpha academic honor society and the Gold Humanism Honor Society. Both the absolute number of themes and the

diversity of themes in each application were calculated and compared between the two populations.

Results: Thirty-nine students met the definition of low performer in the graduation years of 2017-2019. Thematic saturation was reached after surveying 18 medical school applications; 21 applications were reviewed in all. All exceptional performer themes (teamwork, altruism, success in a practiced activity, wisdom, passion, entrepreneurship, and perseverance) were present in the applications of low performing medical students, albeit at a lower frequency and with less diversity of themes. The success in a practiced activity theme and the perseverance theme had the widest difference in representation between the two groups. Three new themes were found in low performers: embellishment of achievement, description of a future event, and witnessing teamwork.

Conclusions: Experience descriptions that prospective students write in their applications may be helpful in predicting future academic and professional performance and could be used by admission committees to inform entry decisions. Low performing medical students had comparatively lower frequencies of every exceptional performer theme and had less diversity in their theme representation; the difference was most notable in the "perseverance" and "success in a practiced activity" themes. This could correlate to less grit and less deliberate practice in the low performing medical student group. Unique themes were found in low performing medical students. Future studies are recommended to assess the evidence for predictive validity of these themes in blinded applications and to assess the generalizability of these themes to average performing medical students.

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BACKGROUND

The medical school application process is composed of many different forms of data provided by the applicant to the admissions committee. Depending on the institution, procurement of this information can occur in two stages (initial application and interview) or in three stages (initial application, supplemental application, and interview).[1] The initial application includes grade point averages (GPAs), standardized test scores, descriptions of one's extracurricular activities and leadership positions, personal statements, and letter of recommendations. Medical school interviewers provide a report of the applicant to the committee that includes ratings on multiple dimensions of the applicant (e.g., interest in the medical field) as well as summary of the content of the discussion between the applicant and the interviewer. The role of the admissions committee is to review these data and make decisions on whom to accept, whom to place on the waitlist, and whom to reject.

There are some aspects of the medical school application that are typically weighed more heavily than others by these selection committees. Medical College Admission Test (MCAT) scores and undergraduate GPAs are deemed highly important when deciding whom to give a secondary application, but these data are less important when deciding whom to admit[1]. When making admissions decisions, the committees place a high value on interview scores and letters of recommendation[1]. The quantitative data of standardized test scores and GPAs provide information to the committee on whether the applicant can withstand the academic rigors of medical school, while the qualitative data of letters of recommendation and interview summaries are used to assess the humanistic qualities of the applicant[1].

The American Association of Medical Colleges (AAMC) is attempting to combat this preference for certain aspects of the medical school application by promoting a holistic review process. A holistic approach to admissions requires that schools evaluate the entire applicant, not just selected aspects of the application. This type of review is based on four core principles: that selection criteria are wide-ranging, that selection criteria are based on experiences and attributes and not just academic performance, that schools reflect on how each applicant may contribute to their institution and the medical field, and that race and ethnicity can be used as factors in admitting applicants but only if used in the broader context of institutional interests and goals associated with student diversity[2]. The use of a holistic review of medical school applications may assist in creating more diverse medical schools (and thus a more diverse physician workforce) because it lessens the weight that institutions place on standardized tests. For example, schools that admit students in the middle of the MCAT score scale tend to be more diverse than those schools who use a higher MCAT score cut-off[3].

However, admission criteria are not the same as predictive criteria with regards to achievement within medical school[4]. Admissions committees have historically been able to select those applicants that can withstand the rigors of medical school and graduate as the graduation rate for MD-only matriculants is approximately 84 percent in four years and approximately 96% in six years[5]. They are less able to predict which prospective applicants will succeed throughout medical school and which students will have academic or professionalism issues.

Previous research has tried to elucidate the relationship between the different components of the medical school application and performance[6-13]. Certain applicant characteristics have been found to be associated with underperformance in the first year of medical school, including

older age, admission to medical school through a joint B.S./M.D. program, and lower undergraduate science GPA[6]. Standardized test scores are associated with pre-clinical year performance and the passing of licensure exams but are not helpful in predicting how a student does clinically[7-10]. Letters of recommendation are also not helpful in predicting performance in medical school[11] and neither are personal statements. Finally, the synthesis of these application components by selection committees is not reliable in predicting which applicants will excel throughout their tenure in undergraduate medical education. For example, there is only a weak association between admission committee tertiary review comments and medical school performance, regardless of positive or negative comments[12].

One aspect of the medical school application that has not been rigorously studied to date is the Work and Activities Section of the AMCAS application. In this section, applicants list and describe up to fifteen extracurricular activities, leadership positions, or awards; three of these can be identified as most meaningful and more space is provided for the applicant to give a more-detailed description of the activity[14]. Recent research conducted at our institution has studied this section of the application, specifically in exceptional performing medical students. Through an inductive approach, seven themes were found: success in a practiced activity, perseverance, passion, wisdom, altruism, teamwork, and entrepreneurship[15].

Using this a priori thematic framework created in the medical school applications of exceptional performers, we sought to determine if there was a difference in how low performing medical school students wrote about themselves in their medical school applications. We hypothesized that a difference would exist based on two separate theories of achievement and expert performance: the theory of grit and the theory of deliberate practice.

GRIT

Grit is defined as the combination of passion and perseverance to attain long-term goals; its concept was created and studied by Dr. Angela Duckworth, a psychologist who researches the phenomenon of achievement.[16] Dr. Duckworth created and gathered validity evidence for a self-reported questionnaire to measure the amount of grit in an individual, and she has studied it in West Point cadets, Ivy League undergraduates, and ranking in the National Spelling Bee[17]. Through her research, she has shown that grit is more important to one's success than talent or natural intelligence.

Dr. Duckworth posits that achievement is based on a combination of effort, talent, and skill, but in her equation, effort counts twice[16]. Her equation for achievement is simply that talent multiplied by effort is skill, and skill multiplied by effort is achievement[16]. It is those that put in the most effort over the long run, regardless of innate factors, that lead to success. This equation also explains why equally talented individuals may differ in their achievement.

Given that medical students and physicians are highly intelligent and talented, the study of grit in medical education is a natural extension of Dr. Duckworth's work. Research has shown that higher grit scores are associated with finishing medical school in 4 years[18], with having a higher grade in the surgery clerkship[19], and with having a higher class rank in a medical school class[18]. Conversely, lower grit scores are associated with higher levels of burnout in internal medicine residents and in first year medical students[20,21]. For these and other reasons, we believe that grit levels would be of interest to admissions committees when trying to predict applicants that will be exceptional performers and those that will be low performers in medical school.

DELIBERATE PRACTICE

The theory of deliberate practice speaks to how one achieves expert performance in a specific task. This theory, initially described by K Anders Ericcson, states that the time spent practicing is important but not sufficient to reach expert performance in a domain—it matters *how* you train[22]. Experts systematically identify their faults and weaknesses and devote energy to improve specific aspects of their performance—therefore it is called deliberate practice. Still, expert performance is rarely achieved until an individual commits at least 10 years of deliberate practice to a task—it is a long and arduous path, and there are times that it is not enjoyable[22]. The emphasis in this theory is on focused effort and not on innate intelligence or talent: higher IQ scores are not related to better performance among accomplished performers in their respective domains[23].

A key tenet to this theory is the use of coaches or mentors to achieve expert performance. These individuals are necessary to provide learners with clear instructions on a task, to diagnose and pinpoint errors in performance, and to give constant and directive feedback[22]. Coaches or mentors can also determine what tasks or aspects of performance the learner should practice in between sessions. One obvious example of this in practice is in sports: both Katie Ledecky and Simone Biles, two incredible athletes in swimming and gymnastics, respectively, have coaches that help them to improve their abilities.

Much like grit, the theory of deliberate practice has been applied and researched in the field of medical education. However, there are fewer studies regarding the prediction of achievement that use this theory as a framework for their research. What we do know is that once in medical school, higher achieving students tend to show more aspects of deliberate practice in their coursework: these students plan their study schedule, have higher levels of

motivation, and self-study for longer than lower achieving students[24]. Because of this, we wondered if the core aspects of deliberate practice in other domains like sports or music might translate into medical training: would applicants who show higher levels of deliberate practice in their application perform better in medical school and conversely, would applicants who show lower levels of deliberate practice on their application perform worse in medical school?

RESEARCH QUESTION

By analyzing the applications of low performing medical students using an a priori thematic framework developed in exceptional performing medical students, we aimed to answer the following research questions:

1. Are the same themes present in the medical school applications of low performing students as exceptional performing students?

2. Do these themes occur at the same frequency in the two populations?

CHAPTER 2: IN THEIR OWN WORDS: A COMPARISON OF MEDICAL SCHOOL APPLICATIONS OF LOW AND EXCEPTIONAL PERFORMING STUDENTS

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Under Consideration

INTRODUCTION

Medical school admission committees have reliably accepted prospective applicants who can withstand the rigors of medical training and graduate[5] but are less able to identify who will excel and who will struggle.

Previous research has attempted to ascertain if different components of the medical school application can predict success in medical school[6-12]. Underperformance during the first year of study has been associated with lower mean undergraduate science GPA, entry into medical school via an accelerated program, and older age[6]. The Medical College Admissions Test (MCAT) score has been shown to be predictive of preclinical performance and the passing of licensure exams [7-9], but it has not portended success during clerkships or intern year[10]. Letters of recommendation also have not predicted achievement during medical school[11]. Finally, the synthesis of these application components by selection committees is not reliable in predicting which applicants will excel throughout their tenure in undergraduate medical education: there is only a weak association between admission committee tertiary review comments and medical school performance, regardless of positive or negative comments[12].

The applicant's reflection and reporting of their own past experiences in the free-response areas of the Work and Activities section of the American Medical College Application System (AMCAS) application is not well studied and may provide unique insights into future performance. In this portion of the medical school application, prospective students can write about themselves and their extracurricular activities, which may include shadowing experiences, hobbies, leadership roles, or sports. This section may show promise for predicting achievement, as previous work by Pflipsen et. al identified seven themes present in the Work and Activities section of exceptional medical students: passion (an intense interest in an activity), perseverance

(the ability to overcome hardship), entrepreneurship (taking initiative to accomplish something), success in a practiced activity (dedicated engagement in an activity leading to improvement or accomplishment), altruism (desire to selflessly help others), and teamwork (an appreciation for collaboration)[15]. However, it is unknown if these themes and/or additional themes are present in low performers.

The aim of our study is to apply this previously created thematic framework to students who performed poorly in medical school because of academic and/or professional reasons. This will determine if differences exist between the two populations (e.g., new themes in low performers and/or differences between the frequencies of themes between exceptional and low performing graduates). We hypothesize that a difference may exist because this study is based on the theories of grit and deliberate practice as both theories do not place an emphasis on raw talent or innate intelligence but rather one's ability to overcome hardship or one's approach to training[17,23].

The theory of grit is described as a combination of passion and perseverance through difficult tasks. It is described as a non-cognitive trait and is thought to be just as important as intelligence in becoming successful [17]. The concept of grit can be applied to any activity on a medical school application if the prospective student shows how he or she overcame challenges and setbacks to accomplish a goal or complete a task.

The theory of deliberate practice states that developing expert performance not only depends on how much one trains but how the training is done (deliberate or effortful practice)[23]. The use of deliberate practice can occur through specific mechanisms such as self-reflection or seeking feedback from mentors. Evidence to support both theories may be manifested in medical

school applications through the development of skills in sports, music, or other hobbies and activities.

If we find a divergence in how low performers and exceptional performers describe themselves, admission committees may be able to use this information to improve their selection decisions. This is important because not only does remediation of low performing medical students take time and effort, but medical schools also have a duty to society to produce the best possible physicians. Further, the knowledge obtained from this study may help de-emphasize standardized test scores and grade point averages from the admissions process, a goal that aligns with the Association of American Medical Colleges push for more holistic admissions policies[2].

By analyzing the applications of low performing medical students using an a priori thematic framework developed in exceptional performing medical students, we aimed to answer the following research questions: Are the same themes present in the medical school applications of low performing students as exceptional performing students and do these themes occur at the same frequency in the two populations?

METHODS:

Design

We performed a qualitative study that assessed the Work and Activities sections of the AMCAS applications of medical students who graduated between 2017-2019 at the Uniformed Services University (USU). We also searched for themes if applicants reported and described their disadvantaged status or if any previous institutional action had occurred. We had complete data for this cohort of graduates which were also the graduation years used for our exceptional performing graduates[15]. Prospective medical students can describe up to 15 experiences on the

AMCAS application; three of these experiences can be designated as "most meaningful" and additional space is provided for an in-depth description by the applicant[14]. The text written by applicants was the primary data for this study. USU is a public and military medical school located in Bethesda, Maryland.

Participants

We defined low performers as a student who was referred to the student promotions committee with an administrative action, such as a letter of reprimand, a period of academic probation, or a decision to decelerate or disenroll from the School of Medicine. We chose this definition because a form of a student promotions committee likely exists at every medical school.

Exceptional performers were those students inducted into both the Alpha Omega Alpha honor society and the Gold Humanism Honor Society (GHHS), a definition chosen to account for students who not only excelled academically but also displayed high levels of professionalism and humanism in medicine[15].

Data Analysis

We used an a priori thematic framework to complete a thematic analysis in the AMCAS applications of low performers[25]. The themes of teamwork, altruism, success in a practiced activity, wisdom, passion, entrepreneurship, and perseverance were developed through an inductive approach from the applications of exceptional performing medical students[15]. We used a constant comparative technique and coded until thematic saturation was reached. Thematic saturation occurs when the review of additional data does not reveal any more novel themes or

insight[26]. As is consistent with this methodology, thematic saturation was determined through the consensus of the research team. New themes were identified and agreed upon by the entire coding team. The applications of exceptional performers were then re-reviewed to determine the presence of low performing themes. All coding occurred in NVivo R1.4.1 (QSR International, Burlington, Massachusetts).

The primary coders were JM (a general internist and education student) and YT (an educational researcher). Each file was coded independently by JM and YT; these codes were then discussed with MP (a family practice physician), MA (a general internist and medical educator), and SJD (a general internist and medical education researcher) until consensus was reached. MP and SJD had previously analyzed exceptional performers and thus ensured consistent coding between exceptional and low performers.

To further contrast the exceptional and low performing populations, we tabulated the total number of codes and the diversity of codes in each applicant for themes present in both exceptional and low performing graduates. We also collected demographic information including age, reported gender, highest MCAT score, and cumulative uGPA. Descriptive statistics were performed using Google Sheets (Google, 2021).

This study was approved by the IRB at the Uniformed Services University (USUHS.2020-042). All included quotes were edited to ensure the confidentiality of these applicants.

RESULTS:

In the graduating classes of 2017-2019 at the Uniformed Services University, we identified 39 low performers. We reached thematic saturation after surveying 18 applications, and we coded 21 applications in all (7 applications from each graduating class).

Of these 21 individuals, 8 were female and the average age of this population was 25 years old (range 21-38). The average highest MCAT score was 30.6 (range 26-34) and the average cumulative undergraduate grade point average was 3.49 (range 2.76-3.82). These demographics appeared like the population of exceptional performers from the same years which included 22 students. In the exceptional performers, the average age of the applicant was 26 (range 22-40) and 9 identified as female. The average of their highest MCAT score was 31.5 (range 27-36), and their mean uGPA was 3.59 (range 2.71-4.0)[15].

Exceptional Performer Themes

We identified passages that rose to the level of the seven exceptional performer themes in medical school applications of low performing students. Brief definitions of these themes and representative quotes are found below.

Altruism

Defined as a sincere eagerness to assist others leading to an inward satisfaction[15], altruism was the most frequent exceptional performer theme represented in low performing medical students:

"By taking the time to communicate in what was often a non-professional circumstance and by showing genuine interest in another's wellbeing, I believe I was more effective at fulfilling my mission of advocating healthy habits." (L007)

Entrepreneurship

This theme was characterized by creating something or improving a process[15]. A description of duties and responsibilities of a job or a leadership role did not meet the level of this theme; however, passages that expounded on bettering an organization or institution met the definition of entrepreneurship:

"As chair, I was elected out of 140 members. I had to organize and plan events, heading a committee of about twenty women. We had a 300% increase in attendance when I was chairwoman because I made sure that every invitee was called personally before the event." (L005)

Success in a Practiced Activity

We distinguished the success in a practiced activity theme by finding passages that indicated training or practice that led to improved performance or achievement. The nature of this training could either be implicitly or explicitly described; some students detailed their training activities while others clearly demonstrated their performance without stating how they practiced:

"The following year, I attended every optional morning practice, spent extra time in the weight room, and took every opportunity for improvement. When the coach told me I would be competing in championships, it was an incredible feeling." (L001)

"Four-year member of the men's varsity team and team captain. I helped lead the team to 4 straight top 5 rankings in the region, and 4 straight top 20 national rankings. We won the conference over Division 1 opponents while being ranked as high as 14 in the region." (L017)

Passion

In order to meet the definition of this theme, the applicants had to show an intense pursuit of an interest[15]. It was often found in connection with music or sports, though it could potentially be applied to any activity.

"Becoming a professional musician in a premier band was my dream for many years--from high school all the way through my graduate training. I've been able to perform for and teach music students from teenage years up through graduate students. I will continue to play and teach--music will always be a large part of my life." (L018)

Perseverance

Perseverance was defined as the ability to overcome obstacles and setbacks in order to accomplish a goal[15]. This theme was seen in conjunction with military training, academic probation, and sports:

"My freshman year, I did not make the varsity squad. Despite failing, I decided I would not give up my goal to play varsity. Athletics hone my ability to perform under pressure, to take criticism in a positive way, and to learn from failure. Through persistence and hard work, I became a meaningful varsity contributor the next three seasons." (L016)

Wisdom

This theme was characterized by the recognition of a new life lesson or self-discovery after performing a job or completing a project[15]. The theme of wisdom manifested as a realization of personal growth in a student's description of their work and activities and it could occur either in a clinical or a non-clinical setting. Wisdom was the second most common theme in low performers behind altruism.

"I learned to recognize patients that needed 'extra space' and independence…over time, I learned to recognize their individual needs more acutely. Instead of holding a patient's arm to walk down a hall, I would first ask them. Often the patient wished to walk on their own, get their own water, or deal their own cards. These moments demonstrated incredible resilience – despite their physical limitations, the patients refused to see themselves as 'limited.' I learned that many patients did not want a servant for each physical task but an empathetic observer, listener, and friend. (Clinical Setting, L016)

"Martial arts taught me to defend myself, but more importantly it taught me never to underestimate anyone and to always try and improve myself." (Non-clinical setting, L028)

Teamwork

We described teamwork as the recognition of the importance of working together to achieve a common goal[15]. There was the least amount of difference between exceptional and low performers in the percentage of applicants with this theme present.

"Like no other group project, this experience tested and improved my team working skills. I worked not only with my local teammates but also with our foreign counterparts, often through email and Skype. We worked on separate parts, putting them together to work synergistically. These skills will allow me to work well with an interdisciplinary healthcare team to provide the best, complete care." (L030)

Further representative quotes for these seven themes in the low performing cohort are found in Table 1.

Table 1. Additional Low Performer Representative Quotes of Exceptional Performer Themes

Theme	Definition[9]	Representative Quote
Teamwork	An appreciation for or reflection of the value of teamwork, collaboration, interpersonal relationships and/or camaraderie	"Working in this club has allowed me to learn to be a leader and to learn to work as a team member. Every one of our events has taken a lot of teamwork and effort to put together and from this I now know how to work with people from different backgrounds and how to think in different ways which will allow me to become a better team member in the hospital when working with other healthcare professionals." (L028)
Wisdom	Gaining of new insight, self-discovery, or awareness from an experience or activity, resulting in an examination of an internal thought process that leads to personal growth, either in clinical or non-clinical settings	"This experience also taught me patience and humility in having to admit mistakes or take responsibility for things that I sometimes could not control. All types of people, in different moods and with different perspectives and expectations, come through the store, and in order to help them, I must strive to understand and meet these expectations. I believe many of the lessons I learned in interacting with customers can be applied toward interacting with patients." (L017)
Perseverance	An ability to overcome hardship, adversity, difficulty, or setback through hard work, commitment, or determination	"My semester of academic probation, however, sparked abundant long-term growth and productivity. I learned the hard way that the dignity associated with never giving

		up at one thing can come at too high a cost if overall performance is compromised. The solution I have chosen is to raise my standards, accepting only whole-hearted effort, and preemptively targeting weaknesses. I did not possess the necessary emotional tools to take advantage of courses early in college, but in time I have adapted my methods in order to get the most of this endeavor. I consider this a positive outcome." (L006)
Passion	An intense interest in an activity or pursuit	"I began taking lessons during the summer, which helped me to understand my major from first-hand experience. I finished my training and earned my certificate the next year. I joined the team upon returning home from my study abroad. Once on the team, I competed in 2 national competitions as well as 1 regional competition." (L030)
Success in a Practiced Activity	Demonstrating either implicitly or explicitly ongoing practice and dedicated engagement in an activity which led to an improvement in one's ability or resulted in success	"This experience taught me how to lead by example, which forced me to prepare more, practice more, and perform better than other students in the studio. As a principal musician, I learned how to represent my section and the School of Music." (L004)
Entrepreneurship	Taking initiative to accomplish, create, or improve something	"I started this club along with a classmate to increase awareness about the need for organ donation, help alleviate

		peoples' concerns with organ donation, and to encourage people to sign up for the donation registry." (L019)
Altruism	A genuine desire to selflessly help an individual or community and reflects an internal reward the student feels from their experience	"My service trips in college gave me a sense of direction that I carry with me every day. I deeply enjoyed being part of a group of people with a shared desire to serve others and the adventure of going someplace new to do it. On these trips, people were voluntarily taken out of their comfort zone and accepted work and accommodations that they would not have typically experienced. These sacrifices were made in order to serve others, and the people that went on these trips rarely had the same outlook on life when they returned as when they left." (L022)

This table contains exceptional performer themes, definitions, and additional representative quotes from the low performing population.

Theme Frequency

While all seven themes were present in the medical school applications of low performers, they appeared at a lower frequency: there were an average of 3.81 total themes present per low performing application compared to an average of 7.86 themes per application in the high performing population. There was also less diversity of themes in each low performing applicant when compared to each exceptional performer. A low performer had a mean of 2.8 different themes per application present while exceptional performers had a mean of 4.5 different themes present. When comparing the percentage of applicants with themes present, the largest contrast between exceptional and low performers was in the success in a practiced activity theme (38% vs. 73%) and the perseverance theme (19% vs. 55%) (Figure 1).

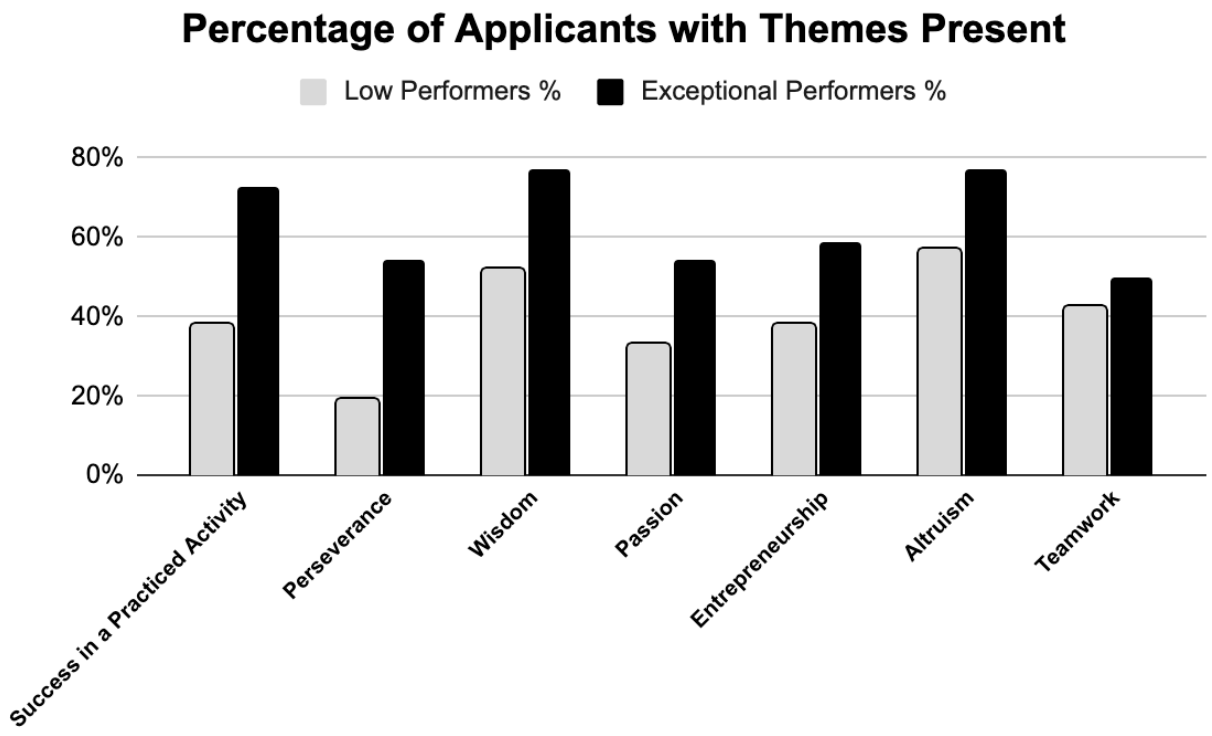

Figure 1. Percentage of Applicants with Themes Present. Between 2017 and 2019, the "success in a practiced activity" and the "perseverance" themes had the largest difference in representation when comparing exceptional and low performers.

New Themes

We identified three new themes in the low performing data: witnessing teamwork, description of a future event, and embellishment of achievement.

Witnessing Teamwork

When comparing passages from the applications of low performers to those of exceptional performers within the theme of teamwork, we discovered a difference that was

isolated to low performers--low performers sometimes described teamwork from the perspective of an *observer* rather than a *participant*. This is what we called "witnessing teamwork," and defined it as an observation of a group or collaboration without active participation.

"I also observed how important it was to work together as a team, because every person on staff was crucial to the proper operation inside the hospice inpatient unit. Interacting with patients and families with different languages and cultures gave me an idea about how I wanted to use my skills as a multilinguist to further assist my patients in the future." (L004)

"My position gives me a great appreciation for the cooperation required among the staff of an emergency department. From the second an individual comes through the door, a team of doctors. nurses, and support staff moves into action. These interactions between the staff directly correlate to the efficiency of care provided. If the staff does not communicate effectively, time is wasted, and the quality of treatment often suffers. In the ER, patient care is not solely the responsibility of the physician but is dependent on the cooperative efforts of the entire staff." (L032)

Description of Future Event

A description of a future event was defined as an elaboration of an experience that has not yet occurred. This might include a job or experience to which an applicant has been accepted but has not yet completed or an applicant might refer to a research project that has not yet come to fruition, and it included phrases such as "I will," "I anticipate," "I plan," or "I intend:"

"I will complete an intense training regimen before taking a written and verbal certification examination. I will then be responsible for disconnecting my patients from their apparatuses in the ER and completely preparing them for departure to their permanent location in the hospital. I will transport patients and their paperwork from the ER to the nurses waiting for them in their determined hospital wings." (L002)

Embellishment of Achievement

Embellishment of achievement was defined as describing or listing an honor, award, or activity as better than it is. An example would be overstating involvement in a specific activity, or listing an activity as an honor or award even though the applicant had not actually won the competition:

"I was nominated by my professor…he later informed me that out of all the nominees, I was number 2 in-line for this award for the year." (L006)

Another example would be an activity that was listed as a publication even though the research project is not finished, submitted, or accepted:

"For the past three years I have been working on a research project. I am currently adding the last pieces of data, and plan on submitting the paper by the end of August or early September." (L032)

DISCUSSION

The results of this thematic analysis of applications of low performing medical students using an a priori thematic framework derived inductively from the applications of exceptional performers suggest that differences may exist in how the two groups describe themselves and their experiences.

With regards to the new themes found in low performers, these findings may be useful to admission committees to distinguish which prospective applicants may perform poorly during medical school. The presence of the description of a future event theme and the embellishment of an achievement theme may simply be due to applicants' attempts to strengthen a weak application to medical school. The overstating of one's achievements occurs at every level of academic promotion[27,28] and these two themes might be manifestations of what one paper has hypothesized are "little lies"[27]. For example, applicants may know their manuscript has not been published yet or that second place is not deserving of an award, but they hope that the manuscript will be published by the time of the interview or that just being nominated was considered an honor by the admissions committee.

The last new theme of witnessing teamwork is a subtle divergence from the main theme of teamwork. It is the difference between active and passive participation in a group setting. Students who value teamwork may integrate themselves better into their healthcare teams during their third year of medical school, and students with higher levels of grit and use of deliberate practice may also more quickly earn the trust of their team leading to more participation than observation in the healthcare team. Due to the pass/fail nature of most medical schools in the preclinical years, clerkship grades often determine the eligibility of induction into Alpha Omega

Alpha and thus explains why the witnessing teamwork theme may be associated with low performance.

The themes of perseverance and success in a practiced activity appeared to have the largest contrast between the two groups which is consistent with the theoretical underpinnings of our research. These findings may be useful in helping admissions committees predict not only which applicants will likely perform better in medical school but also which admitted students may need academic support.

The theme of perseverance may be particularly useful for selection committees and medical schools. Given that exceptional performers appear to have higher frequencies of the perseverance theme in their applications than low performers, the exceptional performers in our study may be grittier than low performers. This claim is supported by other research that found that higher grit scores have been linked to finishing medical school on time and to having a higher rank in the class[18]. At the United States Military Academy, higher grit scores were also associated with higher grades and better overall performance, especially when Standardized Admissions Test scores were held constant[17]. As there are similar standardized test scores between our two populations, this also suggests that admissions committees may be able to emphasize perseverance and grit over MCAT scores when deciding whom to admit and to predict performance in medical school.

While the differences in perseverance may be explained by different levels of grit, the higher frequency of the success in a practiced activity theme in the exceptional performing group may be explained by the theory of deliberate practice. Exceptional medical students may be more likely to approach their activities and their studies in an intentional manner and with more motivation. Previous research supports this finding: higher achieving medical students are more

likely to participate in self-study activities, own more books, read more journal articles, and are more likely to plan out their study schedule[24]. Our data and previous research not only suggest that medical selection committees would want to admit students who show more use of deliberate practice prior to medical school, but also that medical schools could consider coaching and mentorship programs to those admitted students who show lower levels of the success in a practiced activity theme on their application.

There are several strengths of this study. One is that it can be reproducible at almost any North American institution. The AMCAS is a common application used by many medical schools around the country, and many medical schools induct medical students into AOA and GHHS. A form of a student promotions committee also exists at most if not all schools to address students who have academic and/or professionalism problems. This study also incorporated theory to help frame findings and the findings were consistent with the theoretical principles and/or predictions.

However, there are also several limitations with this study. First, this is a single institution study that only reviewed applications to Uniformed Services University, a public and military medical school. Second, the definition of exceptional performers being those students who are inducted into these honor societies is not without potential bias[29]. Third, our study size was small due to our decision to perform a qualitative analysis, thus any significant quantitative inferences based on such limited numerical data should be made with caution, if at all. Fourth, our study may not generalize to average performing medical students—those students who are not considered exceptional or low performers.

Future research could seek to replicate our study at different medical schools during multiple time periods to help determine the generalizability of our results to other institutions in

North America. Additionally, these themes could now be applied to blinded AMCAS applications to ascertain if these themes have evidence of predictive validity for exceptional or low performing medical students. Finally, one could use our themes in average performing medical students to identify differences among the applications of exceptional, average, and low performing medical students.

In conclusion, we performed a thematic analysis of medical school applications of low performing medical students using a constant-comparative method that employed an a priori thematic framework derived from exceptional performing medical students. While limited, our findings suggest that a difference may exist in how low and exceptional performers describe their activities and experiences that is consistent with theoretical expectations. This difference may be useful to selection committees when deciding whom to admit and medical school deans when determining how admitted students may be likely to perform during medical school.

CHAPTER 3: DISCUSSION

EXCEPTIONAL PERFORMER THEMES IN LOW PERFORMERS

The results of this study suggest that there is a difference in how exceptional performers and low performers describe their experiences on their medical school applications. Using a constant comparative method of thematic analysis, we found that the themes of exceptional performers were present in the applications of low performing medical students, although with lower absolute numbers of themes and with less diversity of themes. We also identified themes in the applications of low performing medical students that were underrepresented in the applications of exceptional performers. This information could be useful to medical schools in two ways: it could help admissions committees in determining entry decisions for medical school, and it could assist medical school deans in identifying admitted medical students who may be at higher risk of being referred to the Student Promotions Committee.

The greatest differences in themes between exceptional and low performers occurred in the themes of success in a practiced activity and perseverance. There were more similar frequencies in the themes of altruism and teamwork. Using our theoretical lenses, this suggests that expert performers may distinguish themselves from lower performers through higher levels of deliberate practice and grit.

DELIBERATE PRACTICE IN MEDICAL SCHOOL APPLICATIONS

While skill in one activity does not correlate with performance in a different activity, it is still unclear if the principles of improvement translate from, for example, sports to achievement in medical school. I wonder this because certain key tenets of deliberate practice—having a coach or mentor or finding intrinsic motivation—may have been dependent on what they were

doing. Perhaps medical students will not find studying medicine as enjoyable as what they had done before, or they will not get an academic coach or mentor because it requires more effort than joining a sports team or an orchestra where the coach or conductor is built into the experience. However, this is not what we see in the results of the study—it seems that the principles of deliberate practice do translate from high school and college to medical school based on the differences in the success in a practiced activity theme between the two groups.

The success in a practiced activity theme, however, may not be as useful a predictor of performance in medical school because the ability to perform deliberate practice may favor applicants from higher socioeconomic classes. For prospective applicants to perform deliberate practice during high school and college, both money and time is needed, and applicants from lower socioeconomic statuses may not have access to either. Applicants from lower socioeconomic backgrounds tend to join the military or have more experiences of paid employment, while those of higher socioeconomic backgrounds report more participation in the arts, in college sports, and in research[30]. Being employed takes up important time that a person could be practicing a skill—having a job is an opportunity cost and ensuring that basic needs are met will trump the desire to play sports, practice an instrument, or practice a skill. Additionally, joining a sports team or orchestra may require a fee, and traveling and acquiring required gear and equipment can be a barrier for some activities in families of lower socioeconomic status. Finally, the types of activities that are often described during the success in a practiced activity theme often require significant involvement from parents or guardians, at least in the initial stages of learning a musical instrument or playing a sport[22]. In this study, we did not assess the relationship between annual income reported on the AMCAS application and the presence of themes, but this could be a relationship to explore for future research.

GRIT IN MEDICAL SCHOOL APPLICATIONS

The higher frequencies of perseverance suggest higher levels of grit among exceptional performing applicants compared to low performing applicants. There is also more evidence in the literature to support the predictive nature of grit when it comes to medical school achievement[18,19], likely because it is a personal quality needed to consistently overcome obstacles, regardless of the domain or objective[17]. Research on grit in medical students is already being done—there is now preliminary validity evidence for using the Grit survey to assess medical students[31]. What is interesting is that work to date has found a negative correlation between self-assessed grit and MCAT scores: the higher the grit, the lower the MCAT score[31]. While this does not speak to one's achievement, it may be worth exploring in the future if higher grit scores lead to a greater chance of becoming an exceptional medical student as defined by this study: induction into the Alpha Omega Alpha academic honor society and the Gold Humanism Honor Society. Additionally, the use of grit scores may be able to help diversify the population of physicians in training without sacrificing quality of medical students: schools who admit students in the middle third of the MCAT score scale tend to be more diverse[3]. Grit research done in cadets at the United States Military Academy supports this: higher grit scores were associated with better performance, even when standardized test scores were held constant[17].

LOW PERFORMING THEMES

We found three novel themes in low performers that were not significantly represented in exceptional performers: witnessing teamwork, description of future event, and embellishment of achievement. In addition to the relative frequencies and diversity of themes when comparing exceptional to low performers, these themes that are specific to low performers may also prove useful to admissions committees when making selection decisions.

The difference between the themes of teamwork and observing teamwork is a subtle but important one. It distinguishes between a person who is an active participant versus a passive observer, and it may be related to levels of grit and deliberate practice found within the applicant. There must be a level of trust between a person and other individuals to be included as a member of a team, and this is developed by continuing to show up despite obstacles and barriers to do so (grit) and by being proficient in your tasks (deliberate practice). The medical students who fully integrate themselves as a member of the clinical team likely perform better during their clerkships. Since the grades on clerkships determine eligibility to Alpha Omega Alpha, the degree that one integrates themselves as part of a team may affect one's designation as exceptional.

The description of a future event and the embellishment of achievement may be subtle ways to make an application appear better than it is. These themes are consistent with findings from research done on the curricula vitae of medical faculty applying for jobs and medical students and residents applying for residency and fellowship, respectively[27,28]. Applicants have listed non-existent articles, have shuffled the author order to make it appear that applicant is the first author, or have listed abstracts as full articles[28]. The themes that we found in the applications of low performers are also often related to publications: applicants would list

something as a publication instead of as research although the description written by the applicant clearly states that the paper has not been published yet.

It is unclear from our findings whether these are true errors or are done with intent to try and impress the admissions committees. When it comes to publications, it may be that the process for publication has not been fully discussed so these prospective applicants are unaware of the length of the process or what to expect[27]. However, these might also be what Phillips et al. calls "little lies:" that applicants understand the process but hope that by the time they get an interview or are accepted into the institution, the paper is published or they have are actually able to discuss an experience that had not occurred when they submitted their application[27].

MILITARY RELEVANCE

This study is important to the United States Military because of the desire to train the highest quality military officers and physicians. If the Uniformed Services University can select those individuals who are more likely to succeed and to achieve, this will reflect positively on the University given the need to show our value to the United States Government and to highlight our contributions to medicine and to the military.

Additionally, the results of the research may be useful in identifying those students who may struggle during medical school. Given that both the theory of grit and the theory of deliberate practice emphasize a growth mindset as opposed to a fixed mindset, we may be able to intervene on at-risk students to change the trajectory of their education and even their career. The federal government invests a lot of money into the training of each of these individuals, so it is in the best interest of the military to ensure that these students succeed.

LIMITATIONS

There are several limitations of this study. This research was done at a single institution with a small sample size which limits its generalizability to other medical schools. The Uniformed Services University is also the only military medical school in the country, and it may draw a certain type of applicant. USU draws more applicants from the military academies and who have prior military service—these individuals may have higher levels of grit based on their previous experiences.

Additionally, our study was done only in the applications of exceptional and low performers. The results of this study may not generalize to either high performing medical students (those students who were inducted into either Alpha Omega Alpha or Gold Humanism Honor Society but not both) or to average performing medical students (those students who were inducted into neither but who were not referred to the Student Promotions Committee).

It is also important to note that our study definitions were not without bias: there may be evidence of bias in the selection of Alpha Omega Alpha inductees as prior work has shown that Black and Asian medical students may be less likely to be members than white medical students[29]. Additionally, as noted above, our study might skew towards applicants towards a higher socioeconomic status, as there are more opportunities to pursue different activities or to perform deliberate practice with a coach if one has more money and time to spend on extracurriculars.

Finally, the time frame of this study was prior to the start of the coronavirus pandemic. The findings may not be as useful to medical school applications submitted during the pandemic due to the disruptions of extracurricular activities caused by social distancing measures—this may be especially true of the description of a future event theme found in low performing

medical students. Many students could not complete clinical shadowing experiences or their volunteering activities, and many exceptional applicants have applied to medical school with descriptions of future activities. This hopefully will be a short-lived limitation due to the restarting of extracurricular activities since the release of vaccines.

FUTURE STUDIES

There are multiple directions that this research could go. This study could be recreated at different medical schools of varying sizes and in multiple time frames to provide additional generalizability evidence of these themes to other institutions. This would be helpful in ascertaining if there are reproducible differences between the two groups of individuals and thus can be used by admissions committees all over the United States to assist in entry decisions for prospective applicants. Additionally, the themes found in exceptional and low performers could be applied to blinded AMCAS applications to assess for evidence of predictive validity. Finally, these exceptional and low performing themes could be used in the applications of average performing medical students to identify if differences exist among the applications of exceptional, average, and low performing medical students.

CONCLUSION

Our constant comparative thematic analysis revealed that the same themes found in exceptional performers were present in the applications of low performing medical students, although with fewer instances of themes and with less diversity of themes. The largest difference in thematic frequencies occurred in the success in a practice activity theme and the perseverance theme, which is consistent with our hypotheses that exceptional medical students perform more deliberate practice and have higher levels of grit than low performing medical

students. These results indicate that exceptional performing medical students may describe themselves and their experiences differently than low performing medical students in their medical school applications. This research is a foundational study that can be built upon to refine medical school admissions processes.

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