Assessment of Achievement Motivation in Surgical Subspecialty Residents

Irene Cho[1†], Paul A. Covello[3], Joel Klena[4], Joseph Desantis[5], Matthew Meissner[6], and Rebecca L. Hoffman[2]
[1]Geisinger Commonwealth School of Medicine, Scranton, PA 18509
[2]Department of General Surgery, Geisinger Medical Center, Danville, PA 17822
[3]Department of Oral Medicine and Maxillofacial Surgery, Geisinger Medical Center, Danville, PA 17822
[4]Department of Orthopaedic Surgery, Geisinger Medical Center, Danville, PA 17822
[5]Department of Plastic Surgery, Geisinger Medical Center, Danville, PA 17822
[6]Department of Urology, Geisinger Medical Center, Danville, PA 17822
[†]Doctor of Medicine Program
Correspondence: icho@som.geisinger.edu

Abstract

Background: Goal orientation (GO) theory is used to describe motivational disposition in learners. Three main GO profiles are Mastery (MG), or motivation guided by learning for the sake of content/skill mastery; Performance-Approach (PAP), motivation guided by demonstrating competence compared to others; and Performance-Avoid (PAV), where learners are motivated toward competence by avoiding the appearance of incompetence. Positive correlations between MG and feedback-seeking behavior/job performance/well-being, and negative correlations between PAV and burnout/anxiety/cognitive load have been shown repeatedly in non-medical learners, and more recently, in general surgery (GS) residents but never in surgical subspecialty (SS) residents. The aim of this study was to measure the frequency of GO feelings in SS residents and compare them to that of GS residents from the same hospital system.

Methods: SS residents (orthopaedics, plastics, urology, obstetrics/gynecology, and oral/maxillofacial surgery) participated in a cross-sectional study measuring GO using the Goal Orientation in Surgical Trainees scale, a 10-item survey that measures the 3 domains using a 5-point Likert scale (1=never,3=weekly,5=daily). Mean scale scores were calculated overall, as well as by gender and training level (intern vs chief). T-tests were used to compare study participants to GS residents who previously took the survey.

Results: Seventy-six percent of SS residents participated (44/58). The mean age was 30.3 years and 34% (n=15) were female. Mean overall SS scores were 3.7 for MG, 3.5 for PAP, 3.5 for PAV, showing significant differences only between programs in MG (orthopaedics vs plastics, 4.1 vs 2.7, p=0.01). SS orthopaedic residents scored significantly higher on MG than GS residents overall (4.1 vs 3.7, p=0.04). There were no significant differences seen in SS and GS intern GO profiles. SS chief residents showed significantly higher PAV (3.8 vs 2.5, p=0.0001) and PAP (3.6 vs 2.6, p=0.04) mean scores than GS chiefs.

Conclusion: Examining GO in SS and GS in the same hospital allowed for improved understanding of the specialty-specific cultural influences on motivational learning. Overall, SS residents endorsed mastery feelings occurring between 2 and 4 times per week, with higher MG scores driven by orthopaedics. In both SS and GS, MG scores remained high throughout residency. The differential mastery scores between orthopedics and GS may help guide a learning opportunity between specialties. Furthermore, the increased frequency of more maladaptive PAV feelings in SS chiefs identifies an area of for intervention to nurture more adaptive dispositions throughout resident training.

Introduction

The theories of goal orientation and growth mindset were both conceptualized by Carol Dweck more than three decades ago and are recently being explored in the field of surgery (1–4). Expanding on previous non-medical research showing the impact that positive internal states have on learner performance, a 2020 study with surgical residents across multiple subspecialties showed near unanimous agreement among residents that excellence in the operating room was mediated by certain mindsets (5). These mindsets were found to be influenced by an individual's innate disposition, as well as by the actions and comments of the faculty.

Mindset and achievement motivation (goal orientation) are intimately related to one another. In general, mindset theory relates to a person's beliefs about their ability, and goal orientation (GO) theory describes the subconscious reasoning for the effort behind their learning. In the latter theory, motivation is broken into three constructs: Mastery (MG), when an individual is driven by innate desire to become competent in a skillset, and two performance orientations, where individuals are driven by the desire to impress or avoid disappointing others: Performance-Approach (PAP) and Performance-Avoid (PAV).

In PAP, individuals view themselves as competent and are driven by their desire to display ability amongst their peers. In PAV, individuals are driven by their desire to avoid showing their lack of ability to peers (6). Between the two, PAV is regarded to be a more maladaptive approach to learning. In an academic setting, students that set MG goals showed a higher preference for challenge and academic risk-taking whereas, students that set performance goals showed higher correlations with negative impacts on learning and achievement (7, 8).

Previous work by our group has identified a relationship between higher levels of PAV GO and emotional exhaustion, as well as perceived stress in the general surgery resident population (9). In addition, we have also shown some differences in GO by gender and training level in the same study population

(10). By expanding this to surgical subspecialty residents, the aim of this study was to better understand the distribution of goal orientations among surgical subspecialty residents under one large health system.

Methods

Study Population

All 58 residents in 5 surgical subspecialties (orthopaedic surgery, plastic surgery, urology, obstetrics/gynecology, and oral/maxillofacial surgery) at one large academic medical center were invited to participate in a cross-sectional study to measure GO over the course of 3 months (January–April 2022). All participating residents were on clinical rotations. Residents on research electives or professional development time during the study period were excluded. Demographic information collected included the resident's identifying gender, post-graduate year (PGY) level, age, and surgical specialty.

Program leaders of the five surgical subspecialties distributed a survey link for the Goal Orientation in Surgical Trainees scale (GO-ST), a 10-item validated instrument which measures the frequency of feelings over the previous month in the three domains of GO on a Likert scale (one=never, to a maximum of five=daily) (10). The questions on GO-ST ask residents to reflect on their most recent month of training. The assessment was designed to understand trainee learning processes with their patient and healthcare team interactions in and out of the operation room, such as: *How often have you thought about getting through the day without making a mistake regarding patient care? How often have you thought about how you were perceived by your attending/program director compared to your peers?* Responses measured the frequency of feelings that a resident expressed for each goal orientation domain, where higher scores correlated to more frequent expression of that orientation.

Approval was granted by the Institutional Review Board prior to recruitment of participants and informed consent was obtained through participation of the survey. Participation was voluntary and data was collected, anonymized, and managed using REDCap electronic data capture tools hosted at Geisinger Medical Center (11,12).

Statistical Analysis

Surveys were considered complete and eligible for analysis when all questions were completed. Descriptive statistics for the study demographics were performed. Mean scores were calculated for each question and by each GO domain for the entire population and by specialty. Due to the discrepancy in sizes of surgical subspecialty programs and their participants, for the sake of anonymity, all specialties except orthopaedics were combined and compared with the latter group. For the purposes of comparing GO by training levels, a chief was defined as most senior level trainee within each program and an intern was defined as a resident in their first year of training. Chi square or Fisher's exact test, and Student's T-tests were performed as appropriate to evaluate for differences between groups and scores.

Results

A total of 44 surgical subspecialty (SS) residents (RR=75.9%) completed the survey. Among the surgical subspecialties, orthopaedics (n=20) and plastics (n=4) had a 100% resident participation, followed by oral maxillofacial (n=9, 90%), urology (n=6, 75%), and obstetrics/gynecology (n=5, 31%). More than half of participants (n=27, 64.3%) identified as male (Table 1). The mean age of participants was 30.3 years (SD 2.7). Each subspecialty had at least one intern represented except obstetrics/gynecology.

The mean scale scores by domain were: 3.5 (SD 0.8) for PAV, 3.5 (SD 1.0) for PAP, and 3.7 (SD 0.9) for MG (Table 2).

	Total Cohort	Orthopaedic Surgery	All Other Subspecialties	p-value
Total Residents	44	20 (45.5%)	24 (54.5%)	
Age (mean, SD)	30.3 (2.7)	30.2 (2.2)	30.4 (3.2)	0.74
Male Gender (n, %)	27 (64.3%)	17 (85.0%)	10 (45.5%)	**0.008**
Training Level (n, %)				0.60
Intern	8 (47.1%)	4 (50.0%)	4 (44.4%)	
Chief	9 (52.9%)	4 (50.0%)	5 (55.6%)	
GO Domain (mean, SD)				
Performance Avoid	3.5 (0.84)	3.7 (0.86)	3.4 (0.81)	0.21
Performance Approach	3.5 (0.98)	3.5 (1.03)	3.5 (0.96)	1.0
Mastery	3.7 (0.87)	4.1 (0.71)	3.4 (0.89)	**0.01**
Abbreviations: SD, standard deviation; GO, Goal Orientation				

Table 1. Demographics of the study population by SS group

	Male Gender	Female Gender	p-value
Total Residents*	27	15	
Age (mean, SD)	30.5 (2.6)	30.3 (3.0)	0.81
Training Level (mean, SD)			0.62
Intern	6 (54.5)	2 (33.3)	
Chief	5 (45.5)	2 (33.3)	
GO Domain (mean, SD)			
Performance Avoid	3.5 (0.79)	3.6 (0.98)	0.52
Performance Approach	3.2 (1.02)	3.9 (0.78)	**0.03**
Mastery	3.8 (0.85)	3.5 (0.89)	0.28
*: 2 participants did not identify their gender in the survey Abbreviations: SD, standard deviation; GO, Goal Orientation			

Table 2. Demographics of study participants by gender

Question	Total Cohort	Orthopaedic Surgery	All Other Subspecialties	p-value
1. How often have you thought about making it through the day without making a mistake regarding patient care? (PAV)	3.8 (1.2)	4.2 (1.0)	3.5 (1.2)	0.07
2. How often have you thought about how you were perceived by your attendings/program director compard to your peers? (PAP)	4.0 (1.1)	4.0 (1.7)	4.1 (1.1)	0.81
3. How often have you thought about how a patient interaction would help you to be more prepared for independent practice? (MG)	3.9 (1.1)	4.3 (0.9)	3.6 (1.2)	**0.04***
4. How often have you thought about wanting to appear more competent or skilled compared to your peers? (PAP)	3.8 (1.2)	3.7 (1.1)	4.0 (1.2)	0.39
5. How often have you worried about being perceived as incompetent? (PAV)	3.7 (1.2)	3.9 (1.2)	3.5 (1.1)	0.32
6. Think about some operative cases you have done lately. How often have you felt more relieved after leaving a case because you avoided harsh criticism rather than satisfied with the learning experience? (PAV)	2.6 (1.2)	2.6 (1.2)	2.7 (1.2)	0.86
7. How often have you worried about how a negative patient interaction would make you look to your senior residents/attendings? (PAV)	2.7 (1.2)	2.9 (1.3)	2.5 (1.1)	0.28
8. How often have you worked harder because you wanted to avoid making a mistake or looking incompetent? (PAV)	4.0 (1.1)	4.2 (1.2)	3.8 (1.1)	0.30
9. How often did you seek feedback because you knew it would be constructive for learning? (MG)	3.5 (1.0)	3.9 (0.9)	3.3 (1.0)	**0.05**
10. How often did you seek feedback because you were interested in impoving a skill set? (MG)	3.7 (1.0)	4.1 (0.8)	3.4 (1.0)	**0.01**
Abbreviations: SS, surgical subspecialties; Ortho, Orthopaedic surgery residents; PAV, performance avoid; PAP, performance approach; MG, Mastery *: Colored cells highlight significant values, which are all of the mastery questions.				

Table 3. Mean scores of goal orientation in surgical trainees scale in the total cohort, orthopaedic residents, and other surgical subspecialty residents

	Intern	Chief	p-value
Total Residents*	8	9	
Age (mean, SD)	27.8 (1.3)	33.2 (3.0)	**0.0003**
Male Gender (n, %)	6 (75.0)	5 (55.6)	0.62
GO Domain (mean, SD)			
Performance Avoid	3.6 (0.94)	3.8 (0.51)	0.62
Performance Approach	3.1 (1.2)	3.6 (0.92)	0.35
Mastery	3.6 (0.65)	3.6 (1.0)	1.0
Abbreviations: SD, standard deviation; GO, Goal Orientation			

Table 4. Comparisons by training level

Orthopaedics had significantly higher MG expression that the other SS groups (4.1 vs. 3.4, p=0.01).

The two most commonly endorsed sentiments identified on the GO-ST in all SS residents were worry about how one appears to their program director/attendings compared to peers (performance-approach, mean 4.0±1.1) and working harder to avoid looking incompetent (performance-avoid, mean 4.0±1.1). SS residents overall least commonly endorsed greater relief for leaving a case and avoiding criticism than satisfaction in learning (mean 2.6±1.2). The only significant differences between orthopaedic residents and other SS by individual question were in each of the mastery questions (Table 3), where the orthopaedic residents score significantly higher. While not significantly different, orthopaedic residents also scored higher on each of the PAV questions except question 6, referring to relief versus satisfaction after leaving a case.

By gender, female SS residents scored significantly higher on the PAP scale than males (3.8 vs 3.2, p=0.04). There were no significant differences in PAV or MG expression between genders. Both mean MG, PAV and PAP scores for SS interns were not significantly different from SS chiefs, but both chief PAV (3.8 vs 3.6, p=0.62) and PAP scores (3.6 vs 3.1, p=0.35) were slightly higher than that of interns (Table 4).

Discussion

In this first study of GO in SS trainees, we have shown that there are some differences between specialties, the implications of which may be useful to guide future studies and interventions. Overall, MG expression remained high in all SS residents, averaging 2-4 times per week, followed closely by PAP and PAV expressions. Orthopaedic residents showed the highest resident participation, and their results predominantly drove this trend, with MG dominance disappearing with removal of their data from the cohort. The other surgical subspecialties showed overall highest preference for PAP, followed closely by MG and PAV.

Orthopaedic surgery remains within the top five most competitive residencies to match into, and applicants must

prove their competitiveness through distinguished scores and extracurricular involvement (13). GO studies in non-medical and medical learners have shown that learners with preference for MG had higher levels of autonomous motivation with increased utilization of metacognitive studying strategies (14, 15). While it is possible that the MG preference seen in orthopaedic residents reflects the innate mindsets or extraneous motivational qualities that applicants develop to succeed in a highly competitive field, more studies are needed to further validate this finding. What is evident from this study is that this group of orthopaedic residents think about feedback and are motivated by learning for future patient care, but also care frequently about avoiding the appearance of incompetence, albeit not quite as often. This sets up an interesting situation in motivational learning in which residents recognize the necessity of mastery but do not acquire the inefficiencies bred by a performance-avoid mindset (16).

Another important factor that must be considered, is that when subspecialty residents train in silos of their own without intermingling, they foster their own unique cultural environments. This may perpetuate subspecialty stereotypes and can obscure the unique strengths and abilities of each program. The changes in GO profile dominance seen with and without the inclusion of the orthopaedic cohort demonstrates a small but significant difference amongst surgical subspecialties. GO is a measurement of subconscious motivations, and by applying this to a larger sample size of SS residents, future studies may also be able to capture the subtler specialty-specific cultural differences that affect resident learning.

With recent surgical residency attrition rates increased to as high as 18% overall and 25% in female residents, another area of interest for our study was comparison of GO by gender profile (17). SS female residents showed significantly higher preference for PAP expression compared to their male counterparts. While there were no significant differences seen in MG and PAV expression, female residents had an overall higher average PAV expression and an overall lower average MG expression. These results are comparable to results from a previous study conducted with general surgery residents, where females also showed lower MG scores and significantly higher PAV scores (10). This continuous preference for performance orientations is an area of that requires further understanding in medical learners. Previous studies with non-medical learners have shown that performance-based learners have external loci of control and more likely to consider their performance in the context of others (18). The long-term implications and potential causes of this preference must be explored in future studies with female surgical residents.

Lastly, mean performance profiles were insignificantly increased in chiefs versus interns. Due to gain of experience and skill, we expected that SS chiefs would show less performance-based dispositions, but their scores remained similar if not greater in value to the interns. As a resident advances into a chief title, they gain more responsibility in the operation room and hold a higher obligation to ensuring adequate patient care. These increased workplace expectations may explain the sustained pressure to perform. On the other hand, previous studies have demonstrated that when learners already have requisite ability to perform a task effectively, MG expression is no longer necessary to hone in on these acquired skillsets (3). For residents reaching the end of their training, continued application and improvement in the form of performance profiles can be a reflection of their continued mastery of a skillset. The increase in PAV expression that was seen in chief residents, however, is an area of concern. A previous study with general surgeons showed chief residents with significant decreases in PAV score expression with increased training level (10). There is a clear correlation with PAV and workplace burnout, and a significant increase of PAV seen in chief residents is an area for future educational intervention that may not be limited to institution of study (19).

One of the limitations in this study was that the assessment was only applied to residents under one hospital system, which limits generalizability. Results may have been biased by the educational curriculum specific to Geisinger Medical Center (2022). In addition, attitudes and experiences were limited to the most recent training month. Lastly, SS grouping for statistical analysis and reporting of GO to preserve anonymity limited our ability to comment on specific differences by surgical specialty.

Conclusions

This cross-sectional study was the first to measure frequency of GO in SS residents in an effort to understand whether previously described trends in general surgery were also applicable to other specialties. There was a strong overall preference for MG expression largely driven by the orthopaedic resident cohort, and a rise in PAV feelings in chief residents. Understanding GO across specialties may allow for future studies which can aim to better understanding of how a program culture perpetuates or cultivates adaptive (or maladaptive) goal orientation dispositions.

Disclosures

None of the authors have disclosure(s). No funding was used for this project.

References

1. Dweck CS. Motivational processes affecting learning. *American Psychologist*. 1986;41(10):1040-1048.
2. Bandura M, Dweck CS. The relationship of conceptions of intelligence and achievement goals to achievement-related cognition, affect and behavior. *Unpublished manuscript, Harvard University*. 1985.
3. Gardner AK, Diesen DL, Hogg D, Huerta S. The impact of goal setting and goal orientation on performance during a clerkship surgical skills training program. *Am*
4. Hoffman RL, Hudak-Rosander C, Datta J, Morris JB, Kelz RR. Goal orientation in surgical residents: a study of the motivation behind learning. *J Surg Res*. 2014;190(2):451-456.
5. Babchenko O, Scott K, Jung S, et al. Resident Perspectives on Effective Surgical Training: Incivility, Confidence, and Mindset. *J Surg Educ*. 2020;77(5):1088-1096.
6. Brophy J. Goal Theorists Should Move on From Performance Goals. *Educational Psychologist*. 2005;40(3):167-176.

7. Schunk DH, Meece JL. *Student perceptions in the classroom*. Hillsdale, N.J.: L. Erlbaum; 1992.
8. Dupeyrat C, Mariné C. Implicit theories of intelligence, goal orientation, cognitive engagement, and achievement: A test of Dweck's model with returning to school adults. *Contemporary Educational Psychology*. 2005;30:43-59.
9. Fatunmbi A, Woelfel I, Young K, et al. A new angle on surgical resident wellness: exploring the correlation between emotional exhaustion, stress and performance-avoid goal orientation learning behaviors. *Global Surgical Education - Journal of the Association for Surgical Education*. 2022;2(1):5.
10. Balanoff C, Fatunmbi A, Aarons C, et al. Relationship Between Gender, Training Level and Goal Orientation Achievement Motivation: Implications for Learners and Faculty. *J Surg Educ*. 2022;79(6):e38-e47.
11. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—A metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of Biomedical Informatics*. 2009;42(2):377-381.
12. Harris PA, Taylor R, Minor BL, et al. The REDCap consortium: Building an international community of software platform partners. *Journal of Biomedical Informatics*. 2019;95:103208.
13. Nasser JS, Artino AR, Jr., Kind T, Duan X, Mihalic AP, Chretien K. Matching into competitive surgical residencies: predictors of success. *Med Educ Online*. 2023;28(1):2189558.
14. Sobral DT. What kind of motivation drives medical students' learning quests? *Medical Education*. 2004;38(9):950-957.
15. Archer J. Achievement Goals as a Measure of Motivation in University Students. *Contemporary Educational Psychology*. 1994;19(4):430-446.
16. Ross S, Pirraglia C, Aquilina AM, Zulla R. Effective competency-based medical education requires learning environments that promote a mastery goal orientation: A narrative review. *Med Teach*. 2022;44(5):527-534.
17. Khoushhal Z, Hussain MA, Greco E, et al. Prevalence and Causes of Attrition Among Surgical Residents: A Systematic Review and Meta-analysis. *JAMA Surg*. 2017;152(3):265-272.
18. Kusurkar R, ten Cate O. AM last page: Education is not filling a bucket, but lighting a fire: self-determination theory and motivation in medical students. *Acad Med*. 2013;88(6):904.
19. Licht BG, Dweck CS. Determinants of academic achievement: The interaction of children's achievement orientations with skill area. *Developmental Psychology*. 1984;20(4):628-636.