

The erosion of ambiguity tolerance and sustainment of perfectionism in undergraduate Medical training: A study of clerkship training effects.

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Abstract

Background: Medicine is a field that is simultaneously factual and ambiguous. While studies have examined medical trainees' tolerance of ambiguity (TOA), the extent to which TOA is affected by clinical experiences and its association with perfectionism is unknown.

Methods: This was a multiple sampling, single cohort study of students in their first year of clinical clerkship which is comprised of 6 core rotations. Consenting students completed an online anonymous survey assessing their tolerance of ambiguity (TOA) and perfectionism in their first (pre) and last (post) 12 weeks of their clinical clerkship year. Tolerance of Ambiguity in Medical Students and Doctors (TAMSAD) and The Big Three perfectionism scale-short form (BTPS-SF) were used to assess TOA and perfectionism respectively. Pre-Post mean comparisons of TOA and perfectionism were assessed via t-tests.

Results: From a total possible sample of 174 clinical clerkship students, 51 students responded to pre-survey, 62 responded to post-survey. Clerkship was associated with a significant decrease in TOA ($p=0.00$) with mean pre-TOA scores of 59.57 and post TOA of 43.8. Perfectionism scores were not significantly different over time ($p>0.05$). There was a moderate inverse correlation between TOA and perfectionism before clerkship ($r=0.32$) that increased slightly after clerkship ($r=0.39$). Those preferring primary care specialties had significantly lower rigid and total perfectionism scores in pre-clerkship than those choosing other specialties, but this difference was not found post-clerkship.

Conclusion: We hypothesize that the decrease in TOA seen in this study may reflect an underlying anxiety cycle related to frequent rotation changes. Implications of the role of perfectionism and primary care is discussed. Overall these results require further investigation to better characterize the role of clinical exposure on TOA.

Introduction

Becoming a practicing physician requires the completion of an intensive and demanding residency program. In the final years of medical school students must choose which of the 30 direct entry specialties they wish to specialize in as a career. Many factors can influence a student's choice in career paths including lifestyle, location, and "fit"(1,2). The final years of medical school, also known as the clerkship years, are typically comprised of medical students getting first-hand experience in various medical fields. This serves a two-fold purpose: to create a comprehensive foundation of medical knowledge and to expose them to possible career choices.

Each specialty can vary in the degree of patient information available to practitioners. Patients can present with vague, non-specific symptoms, such as diffuse abdominal pain, or exhibit clear presentations such as a fracture of the humerus due to a fall—or anywhere in between that spectrum. Different presentations are associated with different degrees of ambiguity in diagnosis, treatments, and prognosis. As such, different medical specialization and contexts may potentially be better suited to

certain personality traits. Both Tolerance of Ambiguity and perfectionism are personality traits which, while common, are not frequently researched in the context of medical education and thus are the focus of this study.

Tolerance of Ambiguity

Tolerance of ambiguity (TOA) refers to how we tolerate uncertain information and “the tendency to perceive ambiguous situations as desirable.”(3) Interest in TOA in the medical field can be traced back to the early 1990s. Studies have often led to conflicting results, with some showing a larger, but non-statistically significant, TOA in 3rd-year medical students (3) and others showing no difference (4). Residents have been shown to have higher TOA compared to medical students (5). When looking at baseline data of 13867 matriculating first-year medical students in the United States in 2013, higher TOA was seen in men and older individuals (6). Interestingly, there was a statistically significant relation between TOA and declared specialty of interest; those students pursuing specializations in Dermatology, Physical medicine, and rehabilitation, and otolaryngology have the lowest mean TOA scores in contrast to those selecting Psychiatry, Radiation Oncology, Emergency medicine, and Neurosurgery the highest TOA. However, this was an incidental finding and no further analyses were done. Other studies have shown that surgeons have a lower TOA than other physicians(7). However, we are not aware of research investigating how TOA changes with clinical exposure.

Perfectionism

Perfectionism is a personality trait of interest in the medical field as it has been implicated in anxiety(8), depression(9), and burnout(10). While perfectionism may appear to have an intuitive definition, it is emerging to be a multi-dimensional construct. Although there are several models describing the composition of perfectionism, recent research has identified three measurable dimensions: rigid perfectionism, self-critical perfectionism, and narcissistic perfectionism(11). Rigid perfectionism is defined as requiring “flawless performance from the self”(12), self-critical perfectionism is defined as negative responses to flawed performances(13), and narcissistic perfectionism refers to expecting perfectionism from others in a grandiose, hypercritical, and entitled way (14). Medical students have been shown to have higher perfectionism scores than arts students, with maladaptive perfectionism being predictive of depression and academic distress(15), a result that has been replicated in other studies(10,16,17). As before, we are not aware of any studies investing how perfectionism changes with clinical training and experience and its relationship with TOA.

Rationale

Clerkship is the first time medical students are exposed to a clinical setting. It is at this time where students must learn the practical aspects to medicine, and at the same time discover their ‘fit’ in the field—

what they like, what they don't like, and what specialty they want to pursue. It is a time of significant uncertainty. Literature on how students are affected during this year is scarce.

Objective

This study was guided by three research questions:

1. To what extent does a relationship exist between TOA and perfectionism for 3rd-year medical students?
2. How does clerkship modify these factors and/or their relationship?
3. Do these factors relate to a student's specialty choice?

Methods

Participants

Inclusion criteria

Medical students (N = 174) at the Schulich School of Medicine & Dentistry entering their clinical year, which represented their 3rd year of medical school, and have had an uninterrupted education from first to third-year medical school.

Exclusion criteria

Students who had started previous years and were returning after a gap from clinical practice were excluded.

Exposure

The exposure of interest in this study was clerkship.

Clerkship composition

The clerkship year is comprised of 6 core rotations following 2 years of didactic learning. The 6 core rotations comprise of Obstetrics and Gynecology, Pediatrics, Medicine, Psychiatry, Family Medicine, and Surgery. Obstetrics and Gynecology is centralized at one hospital and is 6 weeks in length where all students get the same exposure. Pediatrics is 6 weeks in length with all students completing 2 weeks of Clinical Teaching Unit and 2 weeks of Pediatric Emergency at one institution, followed by a 2-week pediatrics selective which can differ between students. Medicine is 12 weeks in length with all students completing 6 weeks at a Clinical Teaching Unit in one of two hospitals. During the medicine block, all students complete a 2-week rotation in Emergency medicine. There are two mandatory selectives of 2 weeks each in medical subspecialties which again can differ between students. The psychiatry block is comprised of 3 different psychiatric electives. Family medicine is a 6-weeks rotation with 2 weeks in

academic family medicine and 4 weeks in a rural setting. The surgery block is 12 weeks with 4 weeks in general surgery, 2 in anesthesiology, and the remaining 6 weeks comprised of 3 selective in surgical subspecialties. Students are assigned in one of 6 streams allowing them to start in a different order. However, at the end of the year, all students will have completed all 6 core rotations. The academic year for this cohort of students ran from August 27th, 2018 to August 9th, 2019.

Psychological instruments

Tolerance of ambiguity:

The Tolerance of Ambiguity in Medical Students and Doctors (TAMSAD) tool was developed by Hancock, et al (2015)(5). This is a 29 item Likert scale that specifically assess tolerance of ambiguity in clinical scenarios. This scale has good internal reliability and its use of clinical scenarios makes it an appealing tool for our study.

Perfectionism:

The 16 items Big Three Perfectionism Scale–Short Form (BTPS-SF; Feher, Smith, and Saklofske, 2019) (18) has good reliability and confirmatory factor structure in comparison to the previously well-validated 45 item scale(14). We opted to use the short form for its ease of use and sound psychometric properties.

Survey distribution

The survey comprising of demographics information (gender and age), TAMSAD and BTPS-SF tools, and a list of all medical specialties where students ranked the top 5 specialties they were considering was created on the online research platform, QuatricsTM. The survey was distributed to eligible applicants through the school's undergraduate medical education (UME) office with responses being anonymous to comply with UME policies. This was a repeated single cohort pre and post-study. The survey was distributed at 2 times points: the start of the first rotation (pre-clerkship) and again at the start of the last rotation (post-clerkship). At each distribution, students who had not completed the survey received a 2-week reminder. Students were offered an incentive of a \$5 electronic gift card for each survey they completed for a total of \$10.

Potential biases

One of the co-authors (SN) was a member of the studied cohort. As such, there may be a bias in the recruitment process and results. To minimize this bias, the survey was distributed by the school, and not a member of the team. SN did not participate in the survey. Data was analyzed by another member of the team (SC) who is a researcher and does not have clinical responsibilities, and therefore has no exposure to members of the studied cohort. BL is a staff orthopaedic surgeon who may have interacted with students studied in this cohort. BL participated in study design and manuscript preparation, but was not involved in data analysis or recruitment.

Statistical methods

To ensure the anonymity of participants, the participants' two responses could not be matched. Thus, data analysis was limited to descriptive statistics and group comparisons rather than comparisons of students across time. The anonymous nature of data collection did not allow us to determine number of participants lost to follow up. Data were analyzed with SPSS and pre- and post-test groups were compared using t-tests (19).

Results

Qualitative results

Of the total cohort of 174 students, 51 completed the pre- and 62 completed post-clerkship surveys that were retained for analysis. The gender split was comparable at time 1 (m=24, f=27) and time 2 (m=28, f=34). Participant ages were also comparable before (m=25.31 years, s.d.=2.18) and after (m=26.00 years, s.d.=2.02).

Clerkship and specialty ranking

Overall specialty preferences remained stable in the pre and post surveys (Table 1). Family medicine, Internal medicine, Emergency medicine, Anesthesiology, and Pediatrics remained the top 5 most popular specialties from the start and end of clerkship. Family medicine remained the top with 15/51 ranking it first in the pre-survey and 15/63 in the post-survey.

Table 1 Top 5 most popular specialties pre-clerkship where n=51, and post-clerkship where n=63 (post-clerkship response in brackets)

Specialty	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Family Medicine	15 (15)	13 (15)	4 (3)	6 (1)	5 (3)
Internal Medicine	8 (5)	4 (5)	9 (7)	6 (5)	5 (5)
Emergency Medicine	5 (3)	7 (12)	7 (3)	8 (9)	4 (2)
Anesthesiology	2 (1)	3 (2)	5 (5)	5 (5)	3 (2)
Pediatrics	4 (6)	6 (0)	0 (5)	3 (3)	2 (3)

Tolerance of Ambiguity and Perfectionism for 3rd-year medical students

T-tests were performed to assess the relationship between TOA and perfectionism. The anonymous nature of the survey prevented us from matching participants in pre and post surveys. These are group statistics with different sample sizes (51 pre and 63 post). There is a statistically significant inverse

correlation between perfectionism and TOA at time 1(-0.32, $p < 0.05$) (Table 2). This result is maintained in the post-survey (-.39, $p < 0.01$). Of interest is that narcissistic and rigid perfectionism were significantly correlated with TOA only at the post survey data collection, whereas self-critical perfectionism showed a non-significant correlation with ambiguity tolerance at both times.

Table 2 Relationship between perfectionism and TOA pre-clerkship and post-clerkship (post-clerkship relationship in brackets)

	Rigid ^a	SelfCrit ^b	Narcis ^c	PerfTOT ^d
Rigid ^a				
SelfCrit ^b	.56** (.48**)			
Narcis ^c	-.01 (.20)	.20 (.09)		
PerfTOT ^d	.75** (.77**)	.89** (.79**)	.48** (.57**)	
TOA ^e	-.24 (-.42**)	-.24 (-.18)	-.25 (-.26*)	-.32* (.39**)

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

^a Self-critical perfectionism,

^b Rigid perfectionism

^c Narcistic perfectionism,

^dTotal perfectionism

^e Tolerance of ambiguity

Clerkship and Tolerance of Ambiguity and Perfectionism

The differences in mean TOA and perfectionism between pre and post surveys were assessed using t-tests. There was a significant decrease in TOA between the pre and in the post-surveys ($p < 0.01$). Perfectionism levels remained stable ($p > 0.05$) in both the total and subcategories (Table 3).

Table 3 Pre and post-clerkship TOA and perfectionism.

	Pre Clerkship (n=51)		Post Clerkship (n=62)						
	Mean	s.d	Mean	s.d.	t-value	Df	p-value	95%CI	
SelfCrit ^a	3.22	0.91	3.24	0.86	0.12	111	0.91	-0.31	0.35
Rigid ^b	3.24	0.97	3.12	0.99	0.62	111	0.54	-0.48	0.25
Narcis ^c	1.79	0.59	1.81	0.68	0.15	111	0.88	-0.22	0.26
PerfTOT ^d	2.69	0.59	2.67	0.59	0.13	111	0.90	-0.24	0.21
TOA ^e	59.47	8.26	43.90	7.61	10.41	111	0.00	-18.53	-12.58

s.d., Standard Deviation, *Df*, Degrees of freedom, *CI*, Confidence Interval

^a Rigid perfectionism,

^b Self-critical perfectionism,

^c Narcissistic perfectionism,

^dTotal perfectionism

^e Tolerance of ambiguity

Relationship between TOA and perfectionism with specialty choice

The relationship between TOA and perfectionism with specialty choice was assessed by grouping the top 3 specialties. This was done because of the lower than anticipated response rate, but also because family medicine, internal, and emergency medicine can be classified as primary care specialties. Family medicine, internal, and emergency were grouped and then compared to other remaining specialties. The pre and post surveys were analyzed separately.

For the pre survey, there was a significant difference between the primary care group and “other” with regards to rigid perfectionism ($p=0.01$) and total perfectionism ($p=0.01$) (Table 4) with the primary care specialties having lower perfectionism scores. This relationship was not found in the post-survey ($p>0.05$) (Table 5). There was a non significant relationship between specialties and self-critical perfectionism, narcissistic perfectionism, and TOA ($p>0.05$). Of note was the decrease in self reported TOA for both groups over the period of the one year clerkship.

Table 4 Relationship between specialty choices and TOA and perfectionism pre-clerkship

	Primary care (n= 28)		Other (n=23)		t-value	df	p-value	95%CI	
	Mean	s.d.	Mean	s.d.					
SelfCrit ^a	3.08	0.75	3.40	1.06	1.27	49	0.21	-0.83	0.19
Rigid ^b	2.91	0.98	3.63	0.82	2.80	49	0.01	-1.24	-0.20
Narcis ^c	1.65	0.55	1.96	0.61	1.86	49	0.07	-0.63	0.02
PerfTOT ^d	2.50	0.54	2.92	0.59	-2.62	49	0.01	-0.73	-0.10
TOA ^e	60.04	9.34	58.77	6.86	0.54	49	0.59	-3.44	5.97

s.d., Standard Deviation, *Df*, Degrees of freedom, *CI*, Confidence Interval

^a Self-critical perfectionism,

^bRigid perfectionism

^c Narcistic perfectionism,

^dTotal perfectionism

^eTolerance of ambiguity

Table 5 Relationship between specialty choices and TOA and perfectionism post-clerkship

	Primary care (n= 23)		Other (n=17)		t-value	df	p-value	95% CI	
	Mean	s.d.	Mean	s.d.					
SelfCrit ^a	3.05	0.76	3.45	1.01	1.43	38	0.16	-0.97	0.17
Rigid ^b	2.96	0.89	3.38	1.21	1.28	38	0.21	-1.10	0.25
Narcis ^c	1.89	0.71	1.63	0.76	1.13	38	0.27	-0.21	0.74
PerfTOT ^d	2.59	0.56	2.75	0.74	0.76	38	0.45	-0.58	0.26
TOA ^e	44.15	5.38	41.28	9.77	1.19	38	0.24	-2.01	7.76

s.d., Standard Deviation, *Df*, Degrees of freedom, *CI*, Confidence Interval

^a Self-critical perfectionism,

^bRigid perfectionism

^c Narcistic perfectionism,

^dTotal perfectionism

^e Tolerance of ambiguity

Discussion

Given the limitations of this study, there were some indications that students in this yearlong clinical exposure showed a decrease in the tolerance of ambiguity (TOA) while perfectionism was relatively stable. The perfectionism results were expected given that perfectionism is a relatively stable construct in adults (20). In contrast, these TOA results were unexpected; previous studies have demonstrated an increase in TOA when participants are exposed to artificially ambiguous scenarios (21). Cross sectional studies have shown final year medical students have similar TOA compared to those entering clerkship for their first year, and residents demonstrating higher TOA than medical students (5). As such, clinical exposure decreasing TOA was an unexpected result. These findings might be indicative of the medical student's first year of clinical experience, however further research is needed to confirm these current results.

Should these results hold, a possible area of inquiry might focus on the anxiety cycle. Previous studies have shown that intolerance of ambiguity (low TOA) has been implicated in anxiety(22). The literature on anxiety describes a cycle where anxiety is maintained through short exposures and avoidance of anxiety inducing situations. Theoretically avoidance allows short term relief, and the short exposures do not allow for proper coping skills, which lead to worsening of anxiety(23,24). Perhaps the decrease in TOA observed at the end of the year long clinical exposure was due to a similar mechanism. The frequency of rotation changes may be sensitizing students to ambiguity. At our institution, most rotations last approximately 2 weeks, with the longest lasting 6 weeks. As such, clinical clerks are shifted to different environments more frequently than residents who have rotations lasting months. The frequent changes may not allow medical students to get accustomed to the environment and develop the knowledge and skills to handle varied patient issues, which may leave them in a heightened state of discomfort. Hypothetically, residents have a longer time span between rotations, and as such more time to become accustomed to the uncertainty and develop coping strategies which would account for increased TOA seen in previous studies.

Perfectionism and specialty choice

Our study demonstrated that those with lower rigid perfectionism were more likely to prefer primary care specialties at the beginning of clerkship. It is our view that rigid perfectionism, which is defined as "our own performance must be perfect", is appropriately low in those preferring primary care specialties(11). Primary care specialties are often filled uncertain outcomes, which largely depend on patient compliance to treatment regiments(25,26). A physician's performance in these situations does not have an impact on the outcome. Patient compliance has been shown to be influenced by factors such as a providers'

empathy, and not their medical knowledge (27,28). As such, those thriving in primary care must be flexible in their approaches to patient care which is conducive to those with low rigid perfectionism.

Study strength

The key strength of this study is its repeated sampling of a single cohort at the start and end of their first year of clinical experiences. The two samplings allow us to delve deeper into how these factors can change with time and impact the variability experienced in medical training . Previous research has studied differences in ambiguity across levels of medical training through a cross-sectional design which limits their generalizability (5,6).

Limitations

While these findings present some interesting preliminary findings, there are several limitations. While there were two data collections of a single cohort, due to the nature of our survey, we were unable to match participants at the two time points. This limits the extent to which we can infer the effect of clinical exposure on the same persons over time. Another limitation is the variety of clinical exposures. While all students had similar broad specialty exposures, there are variations in the encounters they may have had within a specialty, or in the subspecialty exposures. The anonymous nature of the study hindered capturing such granular data. These data were not collected in the survey to maximize student participation through a simple survey. With regards to student participation, 50 students responded to our pre-survey and 62 the post-survey. This represents a response rate of 29% and 35% respectively which limits the extent to which the findings can be generalized to the entire cohort, even though participation was around 30% which is in keeping with reported response rates of web-based surveys in the medical field (29).

Conclusions

We have shown that tolerance of ambiguity may decrease with clinical experience. This was an unexpected finding and not previously found in the literature. We hypothesize that this may be due to a sensitization phenomenon. With regards to specialty choices, we demonstrated that at the beginning of clerkship, those who ranked primary care specialties high had lower levels of perfectionism, specifically rigid perfectionism. The literature is scarce on perfectionism and TOA of medical students and the effect of clinical experience. This study adds to this growing body of literature and hopefully encourages further study of how clinical experiences and personality traits impact medical students' speciality choices and future performance as a physician.

Abbreviations

TOA: Tolerance of ambiguity

SelfCrit: Self-critical perfectionism

Narcis: Narcissistic perfectionism

TAMSAD: Tolerance of Ambiguity in Medical Students and Doctors

Declarations

Funding:

This project was funded through the Arthroplasty research fund. Funding was used to pay for gift card incentives as outlined in our methods. The senior author, BL, is a member of the Division of Arthroplasty. BL was involved in study design and manuscript preparation.

Ethics approval and consent to participate:

Ethics approval and consent to participate was obtained through Western University Health Science Research Ethics Board (HSREB) and Lawson Health Research institute for human participants.

HREB Application Number 112320 and Lawson application number: R-18-522.

Lawson approval was obtained August 8th 2018 and HREB on August 22nd 2018

Consent for publication: Not applicable

Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests

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Authors' contributions:

SN contributed to study design, participant recruitment, and manuscript preparation.

SC contributed to study design, data analysis, and manuscript preparation.

DS contributed to study design, and manuscript preparation

BL contributed to study design, and manuscript preparation

All authors have read and approved the manuscript.

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