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

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Research article

Keywords: Tolerance of ambiguity, perfectionism, clerkship, medical students

Posted Date: January 23rd, 2020

DOI: https://doi.org/10.21203/rs.2.21655/v1

Version of Record: A version of this preprint was published on November 10th, 2020. See the published version at https://doi.org/10.1186/s12909-020-02345-5.

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 other psychological factors such as perfectionism is unknown. Methods: This was a single cohort study:174 Students in the first (pre) and last (post) 12 weeks of their 3 rd year comprising of 6 core rotations were invited to participate in an online anonymous survey. The survey included demographic information along with published and validated TOA and perfectionism scales. 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 and correlations were used to detect the effect of clerkship on TOA, perfectionism and their relationship. Results: 51 students responded to pre-survey, 62 responded to post-survey. Clerkship was associated with a decrease TOA ($p<0.00$) with pre-TOA scores at $m=59.57$ and post TOA at $m=43.8$. There was a moderate inverse correlation between TOA and perfectionism before clerkship ($r=0.32$) that increased slightly after clerkship ($r=0.39$). Clerkship was not significantly associated with levels of perfectionism ($P>0.05$). Those preferring primary care specialties had significantly lower rigid and total perfectionism scores in pre clerkship than those choosing other specialties, this difference was not found post clerkship. Conclusion: Clerkship does appear to influence student's tolerance of ambiguity. However, perfectionism remained unchanged. Further work needs to be done exploring tailoring educational interventions to extremes of TOA and perfectionism.

Introduction

Becoming a practicing physician requires the completion of a 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, There are many factors which can influence a student's choice in career paths: life style, 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 to 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 they can be precise such as fracture of the humerus due to a fall or anywhere in between that spectrum. Different presentations are associated with a different degree of ambiguity in: diagnosis, treatments, and outcomes. As such, different environments may potentially be better suited for certain personality traits. The purpose of this study is to investigate tolerance of ambiguity and perfectionism in medical students.

Tolerance of Ambiguity

Tolerance of ambiguity (TOA) refers to how we tolerate uncertain information. This has been defined as "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, non statistically significant, TOA in 3rd year medical students (3) and other showing no different (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. Dermatology, Physical medicine and rehabilitation, otolaryngology having lowest mean TOA scores and Psychiatry, Radiation oncology, Emergency medicine, Neurosurgery scoring 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 physicians(7).

Hancock, et al (2015)(5) developed a 29 item Likert scale specifically assess tolerance of ambiguity in clinical scenarios named: Tolerance of Ambiguity in Medical Students and Doctors (TAMSAD). He demonstrated this scale showed good internal reliability and there was a difference between levels of training—with residents (foundational doctors) having higher tolerance of ambiguity than medical students. This was a cross-sectional study, which differs from our study looking at a longitudinal cohort study.

Perfectionism

Perfectionism is a 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. Recent research has identified three measurable dimensions of Perfectionism: rigid perfectionism, self-critical perfectionism, narcissistic perfectionism(11). Rigid perfectionism is defined as “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(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 which has been replicated in other studies(10,16,17).

Feher, Smith, and Sakflofske (2019)(18) published the 16 item Big Three Perfectionism Scale–Short Form (BTPS-SF), which showed good test-retest reliability and good confirmatory fit from previously well validated 45-unit scale(14). We opted to use the short form for its ease of use and reliability.

Rationale

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 student’s specialty choice?

The strength of this study comes from its multiple measurements of a single cohort. To date no studies have tracked a cohort over the course of medical training and looked at how TOA and perfectionism change as a function of exposure to clinical experiences.

Methods

174 3rd year medical students at the Schulich School of Medicine & Dentistry were invited to participate an online anonymous survey. The third year is comprised of 6 core rotations following 2 years of didactic learning. The 6 core rotations comprise of: ObGyn, Pediatrics, Medicine, Psychiatry, Family Medicine, Surgery and students can be in one of 6 streams. Tolerance of Ambiguity in Medical Students and Doctors (TAMSAD)(5) and Perfectionism Scale–Short Form (BTPS-SF)(18) were used to asses tolerance of ambiguity and perfectionism respectively.

The survey was made available online in the start of the first rotation (pre clerkship) and again at the start of the last rotation (post clerkship). In order to ensure anonymity of participants, the participants could not be matched. Thus, analysis was limited to descriptive statistics and group comparisons. Analysis was done using SPSS(19). The survey was distributed online through Quatrics™ and included the following items: demographics information, a forced ranking of 5 specialty choices, and items from validated scales assessing tolerance of ambiguity and perfectionism. Students were incentivized through $5 electronic gift card for each survey they completed.

Results

Qualitative results

Out of the 174 students, 51 had completed the pre clerkship survey and those were retained for analysis. On the post survey 63 students completed the survey. The gender split was comparable before (m = 24, f = 27) and after (m = 28, f = 34) clerkship. Participant ages were also comparable before (m = 25.31, s.d.=2.18) and after (m = 26.00, 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 out of 51 responses, and post clerkship out of 63 responses (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 (-0.321, $p < 0.05$) (Table 2). This result is maintained in the post survey (-389, $p < 0.01$). Rigid and self critical perfectionism demonstrated a positive relationship ($p < 0.01$) in pre and post survey. Perfectionism sub-categories were positively correlated with total perfectionism ($p < 0.01$) in pre and post surveys.

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

	RIGID	SelfCrit	Narcis	PerfTOT
Rigid				
SelfCrit	.560** (.480**)			
Narcis	− .01 (.2)	.2 (.09)		
Total perfectionism	.75** (.769**)	.89** (.791**)	.48** (.57**)	
TOA	− .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).				

Clerkship and Tolerance of Ambiguity and Perfectionism

The difference in mean TOA and perfectionism between pre and post surveys were assessed using t-tests. There was a significant decrease in TOA in the post survey compared to pre ($p < 0.01$).

Perfectionism levels remained stable ($p > 0.05$) in both the total and sub categories (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	3.22	0.91	3.24	0.86	0.12	111	0.91	-0.31	0.35
Rigid	3.24	0.97	3.12	0.99	0.62	111	0.54	-0.48	0.25
Narcis	1.79	0.59	1.81	0.68	0.15	111	0.88	-0.22	0.26
Total perfectionism	2.69	0.59	2.67	0.59	0.13	111	0.90	-0.24	0.21
TOA	59.47	8.26	43.90	7.61	10.41	111	0.00	-18.53	-12.58

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 together. This was done due to low response rate, and the fact that family medicine, internal, and emergency medicine can be classified as primary care specialties. Family medicine, internal, and emergency were grouped together and were compared to other remaining specialties. The pre and post surveys were analyzed separately.

There is 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 no significant relationship between specialies and self critical perfectionism, narcistic perfectionism, and TOA ($p > 0.05$)

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

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

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

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

Discussion

The purpose of this study was to investigate how tolerance of ambiguity (TOA) and perfectionism were affected by clinical exposures, and how they related to both each other and specialty choices. Participating clinical clerks in their 3rd year of medical school at the start and end of the year showed a TOA decrease while perfectionism stayed the same at the end of the year. Previous studies have shown that perfectionism is a personality construct that is stable over time which is in keeping with our findings(20). However, previous studies have shown that exposing participants to artificially ambiguous scenarios can increase tolerance of ambiguity(21). As such, our findings are unexpected and require further investigation. We propose the following postulations accounting for this finding.

Anxiety regarding residency matching

At our institution the 3rd year of medical school is comprised of core rotation at our home institutions which all students rotate through (with small variations). In 4th year, students perform electives which are

more tailored to their career aspirations. In 4th year students apply through the residency matching process in order to gain specialty training to become practicing physicians. This is a stressful process as the matching process occurs once a year, and determines the direction of your career. Recently there has been a sharp rise in the number of unmatched medical students and while there has been policy changes both from governments and universities to address these problems, there is likely still lingering anxiety from medical students over going unmatched(22,23)(24). Perhaps anxiety over the uncertainty relating to the match process could have been generalized to lower TOA. Possible ways of mitigating this include, but are not limited to, surveying residents over a year period, looking at students at other schools which have a mix between electives and cores in their 3rd year, or surveying students at the start and end of a specific block.

Frequent rotation changes

Clinical clerks rotated through different services typically every 2 weeks, with the longest period being 6 weeks (CTU). Becoming an independent physician requires 2 to 6 years of post graduate training. At the beginning of 3rd year, medical students have had 2 years of didactic lectures. There would have been minimal clinical exposure, exposure to practical management of patients. We hypothesize at the start of 3rd year students may not have a full appreciation of the complexities of patient presentations and the breath of knowledge required. This constant shift of environments may either be not enough time to be comfortable in a field, or students change as soon as they become comfortable. Such a perpetual state of uncertainty and frequent change may have contributed to decrease in TOA. Possible ways to better mitigate this could be: looking at pre-and post after a longer block, or investigating residents who typically spend longer times in one specific environment

Specialty choices

We have shown that those who ranked primary care specialties medicine as their first choice have lower rigid and total perfectionism. While this finding has not been found else where, studies have shown emergency medicine residents being able to perform clinical reasoning in uncertain situations(25). Our finding showed an inverse relationship between TOA and perfectionism, with the lower perfectionism scores in primary care (and emergency medicine) being an unsurprising finding. This is due to the nature of their field which has uncertain presentations and practitioners need to be comfortable with not knowing what type of patient may be presented to them. Overall specialty interest remained stable. This result has been supported elsewhere in the literature(26). However, the literature is scarce with regards to perfectionism scores of different specialties which adds to the novelty of this study to the body of literature.

Study strength

A strength of this study is the multiple samplings of a single cohort. Previous studies have studied differences in ambiguity across levels of medical training through a cross sectional design(5,6). Our

study, which evaluates students pre and post core-rotations gives us better insight on the malleability of student's tolerance of ambiguity.

Limitations

The survey was distributed to one institution which limits the generalizability of medical students as a group. Distributing the scales at other institutions would strengthen the generalizability of these findings, research methodology, and inform further research. This study also recruited trainees at on level of training (3rd year clerkship). Surveying residents in various specialties, and staff physicians, would be interesting to see whether these personality factors are maintained by practitioners, or change with more experience. Finally, it was not possible to match students data at time 1 and 2 for comparison purposes which limited our analysis to group means with different sample sizes in pre and post surveys. Therefore, we cannot ensure that same respondents filled pre-and post survey.

Conclusions

We have shown that tolerance of ambiguity can decrease with clinical experience. This was an unexpected finding and not previously found in the literature. We put forth various to account for this finding which may drive further research. We demonstrated that at the beginning of clerkship, those who ranked primary care specialties high had lower levels of perfectionism, and rigid perfectionism specifically, a finding which has not been directly been found before. The literature is scarce on perfectionism and TOA of medical students and the effect of clinical experience. This study adds to the growing body of literature and sets the foundation for further understanding how clinical experiences shape medical students.

Abbreviations

TOA
Tolerance of ambiguity
SelfCrit
Self critical perfectionism
Narcis
Narcisistic perfectionism
TAMSAD
Tolerance of Ambiguity in Medical Students and Doctors

Declarations

Ethics approval:

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 analysed during the current study are available from the corresponding author on reasonable request.

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

Funding: Funding for this study was obtained through the Arthroplasty group research fund.

Authors' contributions: SN recruited participants, author SC performed data analysis. All authors contributed to study design, manuscript preparation and editing.

Acknowledgements: We would like to acknowledge the Undergraduate Medical Education office for facilitating the distribution of this study.

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