

Graduate Training During the COVID-19 Pandemic: North American Genetic Counseling
Students' Challenges, Intolerance of Uncertainty, and Psychological Wellbeing

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Pandemic

Abstract

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The COVID-19 pandemic has upended genetic counseling (GC) graduate students' lives, as they have been forced to transition, manage, and acclimate to life during a pandemic. The current study is a first step in understanding their lived experiences during this historic, global event. We investigated academic and personal challenges, intolerance of uncertainty, and psychological wellbeing of GC students ($n = 248$) who trained during the pandemic (GC-COV cohort) and those who did not (GC-NoCOV cohort). Participants completed an online survey (July-September 2020) that used validated measures of Intolerance of Uncertainty and Psychological Wellbeing. To assess the academic and personal challenges students experienced during GC graduate training, we developed a 43-item measure. Principal axis factoring of the items revealed categories of challenges related to: Academic & Professional Development, Self-Regulation & Resilience, Institutional & Program Leadership, and Financial Stability. There was no cohort difference in Psychological Wellbeing. Linear mixed-effects modeling showed significant cohort differences in challenges. Multiple linear regression analyses revealed that the GC-COV cohort's Psychological Wellbeing was statistically significantly predicted by Institutional & Program Leadership challenges ($p = .029$), Self-Regulation & Resilience challenges ($p = .013$), and Intolerance of Uncertainty ($p = .010$). For the GC-NoCOV cohort, the statistically significant predictor of Psychological Wellbeing was Self-Regulation & Resilience challenges ($p = .029$). Our findings demonstrate that GC students training during the COVID-19 pandemic have experienced various personal, academic, and psychological disruptions and highlight a need to develop resources and implement interventions supporting students' academic development and psychological wellbeing.

Keywords: genetic counseling; education; COVID-19; challenges; psychological wellbeing; intolerance of uncertainty

What is known about this topic

To date, no research has investigated the training experiences of genetic counseling graduate students during the COVID-19 pandemic.

What this paper adds to the topic

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This timely study provides information about genetic counseling students' challenges, intolerance of uncertainty, and psychological wellbeing during the COVID-19 pandemic and explores the educational implications of these findings.

Graduate Training During the COVID-19 Pandemic: North American Genetic Counseling Students' Challenges, Intolerance of Uncertainty, and Psychological Wellbeing

Like many other students around the world, genetic counseling (GC) students never factored a pandemic into their graduate training. As universities confronted the COVID-19 outbreak, GC programs were forced to make quick decisions and rapidly adapt to a new normal. The academic and personal challenges GC students faced during the COVID-19 pandemic are unprecedented, as universities moved all or most classes online and greatly reduced or halted in-person clinical training opportunities. GC students' lives were upended as they had to transition, manage, and acclimate to life during a pandemic. This study is a first step in understanding GC students' lived experiences during this historic, global event.

The COVID-19 pandemic created and exacerbated challenges in all aspects of life (Son et al., 2020). For university students the pandemic greatly diminished their ability to focus on academic work and foster community, while social isolation increased their stress, negative emotions, and anxiety thereby negatively impacting their psychological health and wellbeing (e.g., Anglim & Horwood, 2021; Aristovnik et al., 2020; Wang et al., 2020). Studies of graduate and medical students from around the world have shown decreased social connectedness, worries about academic performance, increased stress, difficulties with motivation, concentration problems, and financial stressors, as well as an increased prevalence of mental illness symptomatology (e.g., Lyons, Wilcox et al., 2020; O'Byrne et al., 2021; Schneider et al., 2021). Such pandemic-related challenges experienced by graduate and medical students are particularly concerning, as the incidence of mental health disorders in this population was already above national averages before the pandemic (e.g., Cantor et al., 2018; Jungbluth et al., 2011). Therefore, the psychological health of students with pre-existing mental illness conditions may be especially negatively impacted by the pandemic.

The uncertainty associated with the COVID-19 pandemic and all its repercussions is an additional challenge that students have had to navigate. Importantly, some individuals are less

able than others to tolerate uncertainty (Lauriola et al., 2018) and such intolerance is related to lower mental wellbeing (Satici et al., 2020) and greater symptoms of anxiety and depression (Lally & Cantillon, 2014; Taha et al., 2014). Consequently, students with higher intolerance of uncertainty may be especially at risk for decreased psychological health during the pandemic.

Graduate students' challenges during the COVID-19 pandemic can also vary depending on their field of study. For post-baccalaureate students in health-related fields (e.g., medicine, psychology, counseling), the pandemic caused disruptions and challenges in their academic studies as well as their in-person clinical practicums and rotations, contributing to students' decreased psychological health, lessened confidence, lower sense of professional development, and lower feelings of clinical competence (e.g., King, 2020; Lasheras et al., 2020; Lyons, Wilcox et al., 2020). To the best of our knowledge, there is no research on GC students' challenges and psychological health during the pandemic. Our study begins to address this gap in the literature.

Study Goals

The overall purpose of this study was to identify the impact of the COVID-19 pandemic on GC students' psychological health. Rather than measuring psychological health as low levels of mental illness symptomatology or stress, as most researchers have done (e.g., Lasheras et al., 2020; O'Byrne et al., 2020; Wang et al., 2020), we chose to add to the emerging literature on university students' positive psychological functioning during the pandemic (e.g., Anglim & Horwood, 2021; Tan et al., 2021) by assessing participants' psychological wellbeing. Previous research has indicated that pre-existing mental health disorders and intolerance of uncertainty are also potential predictors of students' psychological health; therefore, we included these constructs in analyses, as well.

The first goal of our study was to determine whether students who trained during the COVID-19 pandemic (GC-COV cohort) experienced poorer psychological wellbeing than their peers who trained prior to the pandemic (GC-NoCOV cohort). The second goal was to determine whether the GC-COV cohort experienced greater challenges than did the GC-NoCOV cohort. The third goal was to investigate, separately for each cohort, whether challenges, mental health status, and intolerance of uncertainty were significant predictors of psychological wellbeing. Ultimately, we aimed to identify the challenges GC students have experienced that institutions, faculty, and program leadership may need to address.

Methods

Participants

Eligible participants for the GC-COV cohort, who experienced at least some of their training during the COVID-19 pandemic, included those who had begun their second or third year of training as well as individuals who graduated in the Spring of 2020. For the GC-NoCOV cohort, we recruited genetic counselors who graduated in either 2018 or 2019 and thus did not attend GC graduate school during any portion of the pandemic. An *a priori* power analysis showed that a sample size of 200 was needed for a regression model with up to 15 predictors (power = .95, alpha = .05, effect size = .15). Our sample size was 248.

The university's Institutional Review Board reviewed and approved the study (HUM00182007). From July to September of 2020 we recruited participants who attended accredited GC graduate training programs in the United States and Canada by first recruiting program directors (PDs) via the Association of Genetic Counseling Program Directors (AGCPD) listserv. Responding PDs were provided a description of the study and a separate recruitment email to send to all current students and recent graduates. We also used the Student Research Survey Program through the National Society of Genetic Counselors (NSGC) and social media sites (e.g., Twitter, Facebook, LinkedIn) for recruitment.

Instrumentation

Participants completed a survey that asked them to reflect on their challenges and psychological wellbeing during the time period in which they attended GC graduate school and to then answer each item only as it pertained to their experiences during that period of time. Two versions of the survey with slight differences in wording were created to reflect the time of graduate training. Measures reported here are a subset of those from a larger, unpublished study.

Demographics and Program Locations. Participants reported their gender identity, racial background, Hispanic-origin status, and their graduate program's state or province.

Challenges. Using previous literature (Jungbluth et al., 2011; Schlemper, 2011) and discussions with GC students and research team members, we created 43 items to assess various challenges, both graduate-school-specific and non-graduate-school-specific, that participants may have experienced during the time in which they attended graduate school. Participants read each statement and rated their agreement from 1 (Strongly Disagree) to 5 (Strongly Agree), with higher scores indicating greater challenges. They could also select "Not Applicable."

Psychological Wellbeing. To measure participants' psychological wellbeing, we used the 18-item version of Ryff's Psychological Well-Being (PWB) scale (Ryff & Keyes, 1995), a multidimensional measure of psychological wellbeing. We chose the PWB because items in the six subscales pertain to relevant aspects of GC graduate training: positive relations with others, purpose in life, personal growth, autonomy, self-acceptance, and environmental mastery (i.e., affecting events/objects in the environment). Participants rated their agreement with each statement from 1 (Strongly Disagree) to 7 (Strongly Agree). We computed a mean score, with higher scores indicating higher Psychological Wellbeing. Ryff and Keyes (1995) reported strong concurrent validity. In the current study Cronbach's alpha was .80.

Mental Health Status. Participants indicated (yes or no) whether they had been diagnosed with a mental health condition (or more than one). Based on their answer, we divided them into two Mental Health Status groups: No Mental Health Condition or Mental Health Condition. Those stating "Prefer Not to Answer" were not included in analyses.

Intolerance of Uncertainty. Our measure of uncertainty intolerance was the 12-item Intolerance of Uncertainty Scale (Carleton et al., 2007). Participants rated each item from 1 (Not at All Characteristic of Me) to 5 (Entirely Characteristic of Me) in terms of how they generally feel about uncertainty. We calculated a mean score, with higher scores corresponding to higher intolerance of uncertainty. Carlton et al. (2007) reported strong convergent validity and internal consistency. In the current study Cronbach's alpha was .89.

Procedure

The 30-minute survey was administered in REDCap, a web-based, HIPAA-compliant research tool. After providing informed consent, participants were directed to the surveys. The order of measures was as follows: 1) Psychological Wellbeing, 2) Intolerance of Uncertainty, 3) challenges, 4) Mental Health Status, and 5) demographic information. Upon completion, participants could choose to enter a lottery for one of 23 cash prizes (\$50). We also provided links to health and wellbeing resources for potential assistance.

Analytical Strategy

Data were analyzed using Stata Release 15 and SPSS Version 27. We checked the dataset for missing or discrepant data and examined the relevant assumptions for factor analysis and regression. To rule out the impact of skewing, we transformed skewed variables and reexamined the assumptions. Results for untransformed variables are reported here for interpretability. To

reduce the 43 items pertaining to participants' challenges during graduate school into usable categories for analyses, we conducted principal axis factoring (PAF).

In general, we used an exploratory approach. First, we used simple t-tests to explore the evidence for a relationship between cohort and Psychological Wellbeing as well as cohort and the four types of challenges identified by the PAF. There was no significant difference between the GC-COV cohort ($M = 5.51$, $SD = .64$) and GC-NoCOV cohort ($M = 5.67$, $SD = .63$) in Psychological Wellbeing [$t(245) = 1.86$, $p = .06$]; therefore, we only advanced our exploration of cohort effects on the four categories of challenges using two-step linear mixed-effects modeling (LMM). LMM was chosen because it makes use of all available data and is not affected by randomly missing data (Gueorguieva & Krystal, 2004). In the first step, we fit a model of challenge score on challenge type, demographics, Mental Health Status, and Intolerance of Uncertainty with random intercepts by participant. Demographics included gender identity, Hispanic-origin status, and racial background. For racial background we created a dummy variable (non-White vs. White). A Likelihood-Ratio (LR) test was used to compare the model in step 1 with a second model that additionally contained cohort and the interaction between cohort and challenge type as fixed-effect factors. A Bonferroni correction ($p = .025$) was applied to account for multiple testing. We concluded our exploration by testing identical models of Psychological Wellbeing in each cohort through two-step multiple linear regressions. For each cohort separately, we used an LR test with Bonferroni correction ($p = .025$) to compare a null model containing only demographics to a full model containing demographics, challenges, Mental Health Status, and Intolerance of Uncertainty.

Results

Although it is not possible to know how many potential participants received the recruitment emails or saw the social media recruitment advertisements, we used data from the Association of Genetic Counseling Program Directors about the size of entering GC classes in North America for the two cohorts and computed an AAPOR Response Rate 1 of 41% (166/406) for the GC-COV cohort and 12% (82/696) for the GC-NoCOV cohort.

Cohort Demographics, Program Locations, Mental Health Status, and Intolerance of Uncertainty

Table 1 displays the number and percentage of individuals from the two cohorts in the demographic categories of gender identity, racial background, and Hispanic-origin status. Also

presented are the geographic locations of the GC programs and the number and percentage of individuals reporting a diagnosed mental health condition. For geographic location of GC program, we used regions delineated by the U.S. Government Census Bureau (2020) to group the states into four categories: 1) West, 2) Midwest, 3) South, and 4) Northeast. Canadian provinces formed a fifth category. Pearson chi-squared analyses and a Fisher's Exact test showed no significant differences between the two cohorts in any of these variables. Participants attended GC graduate schools across all regions of the U.S. as well as in Canada. The majority of participants were female and White, findings consistent with recent research on the demographics of GC students in North America (Stoddard et al., 2021).

To investigate whether the cohorts differed in Intolerance of Uncertainty, we conducted an independent-samples t-test. The GC-COV cohort ($M = 2.64$, $SD = .76$) and the GC-NoCOV cohort ($M = 2.55$, $SD = .72$) did not statistically significantly differ, $t(245) = -.846$, $p = .399$.

Exploratory Factor Analysis of Challenges Experienced During Graduate School

The PAF (with promax rotation) of the 43 items about GC students' challenges showed nine factors with eigenvalues greater than one. The scree plot showed that five factors should be retained. The five-factor solution was interpretable; thus, we retained only those five factors. We re-ran the analysis, forcing the extraction of five factors and setting the factor loading criteria to .32, as recommended by Tabachnick and Fidell (2013: cited in Watson, 2017). Following Watson's (2017) procedures, we removed one low-loaded item and ten items with communality values below .40 and re-ran the analysis. When a 5-factor solution could no longer be extracted, we forced the extraction of four factors. As recommended by Watson (2017), we removed dual-loaded items when the difference between values was less than .10 and re-ran analyses after each item's removal. The 29-item, 4-factor simple solution explained 62.55% of the total variance.

Factor 1 (Academic & Professional Development) explained 36.92% of the variance and contained 13 items pertaining to academic progress and professional development. Factor 2 (Institutional & Program Leadership) explained 12.36% of the variance and contained six items related to students' interactions with their institution, faculty, and program leadership. Factor 3 (Self-Regulation & Resilience) explained 7.47% of the variance and contained eight items related to students' ability to maintain their motivation, handle stress, care for themselves, and adapt to change. Factor 4 (Financial Stability) explained 5.80% of the variance and contained two items about finances. These two items were highly correlated ($r = .74$, $p < .0005$) and

weakly correlated with other items; thus, we retained this 2-item factor (Yong & Pearce, 2013). We computed mean scores for each factor to use in analyses. Cronbach's alphas ranged from .86 to .93. Table 2 presents items in each factor and their pattern matrix loadings.

GC Training During COVID-19: Its Relation to Challenges

Independent-samples t-tests showed significant cohort differences in challenges pertaining to Academic & Professional Development [$t(237) = -13.20, p < .001$] and Self-Regulation & Resilience, $t(237) = -8.41, p < .001$. Therefore, we continued our investigation of predictors of GC students' challenges by conducting a linear mixed-effects model. Table 3 presents the results of two-step linear mixed-effects models predicting challenge scores. An LR test indicated that the inclusion of cohort and an interaction between cohort and challenge type provided a significant improvement in the model, $X^2(4) = 137.28, p < .001$. Significant main and interaction effects were detected for challenge type and cohort ($p < .001$ in all cases), indicating that challenge scores varied by cohort, and that cohort membership had a greater impact on certain challenge types. Specifically, membership in the GC-COV cohort predicted increased challenge scores for Academic & Professional Development ($p < .001$), Self-Regulation & Resilience ($p < .001$), and Financial Stability ($p = .019$).

Challenges During Graduate School: Their Relation to Psychological Wellbeing

To gain further insight into GC students' psychological wellbeing and challenges during graduate school, we used multiple linear regressions to investigate, separately for each cohort, whether challenges predicted Psychological Wellbeing. We first tested the null model, which included only the demographic variables. We then added to each model the four types of challenges, Mental Health Status, and Intolerance of Uncertainty. Likelihood-Ratio tests indicated a statistically significant improvement between the null model and full model for the GC-COV cohort [$X^2(6) = 51.15, p < .001$] and for the GC-NoCOV cohort, $X^2(6) = 27.61, p < .001$. As Table 4 shows, the significant predictors of Psychological Wellbeing in the full model for the GC-COV cohort were Institutional & Program Leadership challenges, Self-Regulation & Resilience challenges, and Intolerance of Uncertainty. The significant predictor of Psychological Wellbeing for the GC-NoCOV cohort was Self-Regulation & Resilience challenges.

Discussion

Our study of GC students' lived experiences during the COVID-19 pandemic is an important contribution to the growing body of research concerning the effects and ramifications

of this historic event. The GC-COV cohort reported greater challenges; however, the cohorts did not differ in Psychological Wellbeing. When investigating the predictors of GC students' Psychological Wellbeing, we found for both cohorts that the greater students' Self-Regulation & Resilience challenges, the lower their Psychological Wellbeing. For the GC-COV cohort, greater Institutional & Program Leadership challenges and higher Intolerance of Uncertainty also significantly predicted lower Psychological Wellbeing.

GC Training During COVID-19: Its Relation to Challenges and Psychological Wellbeing

Our findings that the GC-COV cohort experienced greater challenges than the GC-NoCOV cohort in Academic & Professional Development and Financial Stability are consistent with pandemic-related research demonstrating graduate and medical students' difficulties in gaining sufficient clinical experience, feeling prepared, adapting to online learning and telehealth, collaborating with classmates, engaging in professional development, and having adequate finances (e.g., King, 2020; Lasheras et al., 2020; Lyons, Wilcox, et al., 2020). The short- and long-term effects of graduate students' challenges in academic and professional development during the pandemic are still unclear. However, institutions and academic programs across the world are trying to address the repercussions of the pandemic to provide students the educational and clinical experiences necessary for their learning, development, and success as healthcare professionals (Lyons, Christopoulos et al., 2020; Regier et al., 2020). Weiss and Li (2020) suggested ways to transform medical education during and beyond the pandemic to better serve students. Our results suggest these interventions could also benefit GC graduate students.

We also found that GC students training during the pandemic reported greater challenges pertaining to self-regulation and resilience. The rapid changes, stress, fear, and uncertainty surrounding the pandemic and its impacts have been emotionally and cognitively taxing for university students (Wang et al., 2020). Therefore, the GC-COV cohort's greater challenges with adapting to change and regulating their emotions are not surprising and are consistent with recent research showing that university students have experienced difficulties during the pandemic in maintaining motivation and concentration, and managing negative emotions (Tasso et al., 2021).

Several recent studies have demonstrated university students' lower psychological health during the COVID-19 pandemic (e.g., Aristovnik et al., 2020; Tasso et al., 2021; Wang et al., 2020). Our finding that the GC cohorts did not differ in psychological wellbeing does not support these studies. Unlike most previous research, we assessed psychological health by measuring

psychological wellbeing rather than levels of stress, anxiety, and/or depression. Therefore, it may be that the effects of the pandemic on this aspect of psychological health are not as pronounced as the effects on stress or mental illness symptomatology, especially when assessed relatively early in the pandemic. Consistent with this explanation, Tan et al. (2021) found that during the pandemic university students' average score on Ryff's PWB scale (Ryff & Keyes, 1995) indicated relatively positive psychological wellbeing. Alternatively, our finding may be due to self-selection bias, in that GC students experiencing low psychological wellbeing during the pandemic chose not to participate in our study due to the potential distress it could cause.

Predictors of GC Students' Psychological Wellbeing

Regression analyses for both GC student cohorts revealed that greater Self-Regulation & Resilience challenges were significantly related to lower Psychological Wellbeing, a finding consistent with other pandemic-related research (Tan et al., 2021). Our results suggest that GC students' self-regulation and resilience challenges may negatively impact their psychological wellbeing. These results have important educational implications that extend beyond the pandemic. They potentially reveal a need for institutions and GC programs to proactively address students' self-regulation and resilience challenges by providing additional support and resources, evidence-based interventions, and possible curricular and systemic changes. Such interventions and systemic changes may not only benefit students' psychological wellbeing through the development of their self-regulation and resilience, but also may have a direct positive impact on their psychological wellbeing. Researchers have identified specific methods for creating academic climates that more purposefully assist in strengthening students' resilience and self-regulation (Luberto et al., 2020; Schlesselman et al., 2020). For example, Schlesselman et al. (2020) have suggested increasing faculty-student conversations, developing peer-mentoring programs and support groups, organizing frequent faculty-student and student-student check-ins, and instituting online, group mindfulness/meditation sessions. A variety of strategies for increasing students' self-regulation and resilience are available to institutions, GC programs, and faculty, including mindfulness training, peer coaching, seminars on resilience, and developing self-reflection skills through course assignments or journaling (e.g., Luberto et al., 2020; Thomas & Asselin, 2018; Wald et al., 2016).

We found that higher Intolerance of Uncertainty significantly predicted lower Psychological Wellbeing for the GC-COV cohort but not for the GC-NoCOV cohort. It may be

that the psychological wellbeing of GC students who already tended to have high intolerance of uncertainty was particularly negatively affected by the profound uncertainties associated with the COVID-19 pandemic. Kesner and Horáček (2020) posited that intolerance of uncertainty could play an especially important role in individuals' psychological health during the pandemic; therefore, our findings are consistent with their supposition. Our results are also in accordance with research showing lower psychological health during the pandemic in individuals with higher intolerance of uncertainty (Rettie & Daniels, 2020). Studies on the relationship between intolerance of uncertainty and psychological distress during the COVID-19 pandemic have shown that both rumination (Rettie & Daniels, 2020) and poor coping strategies (Satici et al., 2020) mediate the relationship between intolerance of uncertainty and psychological health. Rumination is a maladaptive form of self-regulation (Koster et al., 2015) and poor coping strategies are predictive of lower resilience (Campbell-Sills et al., 2006). Consequently, developing GC students' resilience and self-regulation skills may also benefit students' psychological wellbeing by reducing rumination and maladaptive coping.

Although the cohorts did not differ in Institutional & Program Leadership challenges, this category of challenges significantly predicted the GC-COV cohort's Psychological Wellbeing. It may be that during the COVID-19 pandemic's unprecedented time of upheaval and uncertainty, students have relied more heavily than usual on their institution, program leadership, and faculty members for information and guidance to help them manage their wellbeing. During the pandemic many processes have been disrupted and decisions regarding both short- and long-term solutions have rarely been transparent to students. This, then, may have contributed to students' lower psychological wellbeing. Foster and McAdams (2009) have highlighted that effective educational leadership depends on a climate of transparency based on fair expectations and procedures where there is regular communication between students and leadership. As institutions continue to navigate the pandemic and move into a post-pandemic world, it is critical for leadership to evaluate effective mechanisms for regularly communicating both certain and uncertain information to students, and for actively involving students in decision-making (Kachra & Brown, 2020). Even when the specific logistics are unclear, communication from leadership that relays confidence in students' ability to achieve training goals can help build trust (Kachra & Brown, 2020) and may assist in strengthening students' psychological wellbeing.

Limitations

A limitation of our study was the relatively small sample size, especially for the GC-NoCOV cohort, which decreased statistical power when investigating interactions between cohort and predictors of psychological wellbeing. In addition, our study design precluded the ability to assess causal directions; therefore, although our explanations of our findings merit consideration, they are tentative. Further, our sample may have been affected by self-selection bias. The recruitment materials indicated that the study was about GC students' graduate training and psychological health during the COVID-19 pandemic; thus, some individuals may have refrained from participation due to potentially distressing questions or having few difficulties during the pandemic. Another limitation is that our measures were all self-report; therefore, participants' responses may have been affected by social desirability bias and/or recall bias. Additionally, the GC-COV cohort was surveyed from July to September of 2020, so their reactions and challenges may have changed as the pandemic progressed. We also cannot rule out the possibility of order effects, as all participants received the measures in the same order.

Although a strength of our correlational study was that we included a comparison group to better ascertain whether the COVID-19 pandemic may have increased GC students' challenges and lowered their psychological wellbeing, we cannot be certain that the differences between the two cohorts in challenges were due to the pandemic. While our findings showed that the cohorts did not significantly differ on several demographic variables, they may have differed on unmeasured demographic variables that affected their challenges during graduate training. In addition, during the COVID-19 pandemic there were other major events occurring in the United States and globally (e.g., political divisiveness, racial/social injustice, violence) that may have played a role in the cohort differences in challenges, especially those related to self-regulation and resilience. Further, responses for the GC-NoCOV cohort were retrospective; thus, it may have been difficult for them to accurately remember their experiences during graduate training.

Conclusions

Our study provides insight into the educational and personal challenges GC students have experienced during the COVID-19 pandemic, as well as their psychological wellbeing. The results highlight the need for GC graduate training to focus on students' challenges as essential components of clinical and academic development and indicate the importance of providing psychological support to GC students as they navigate the rigors of their training environment.

Author Contributions

Eva Kahn conceived of and designed the study, constructed the online surveys, collected the data, contributed to the writing, and critically reviewed the manuscript. Jane P. Sheldon assisted in the study design, conducted data analyses and interpretation, contributed to the writing, and critically reviewed and revised the manuscript. Alicia Carmichael conducted data analyses and interpretation, contributed to the writing, and critically reviewed the manuscript. Beverly M. Yashar assisted in the study design, contributed to the writing, and critically reviewed the manuscript. Authors Jane P. Sheldon and Alicia Carmichael confirm that they had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analyses. All authors gave final approval of this version to be published and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Conflicts of Interest

Eva Kahn, Jane P. Sheldon, Alicia Carmichael, and Beverly M. Yashar declare that they have no conflicts of interest.

Human Studies and Informed Consent

All procedures were in accordance with ethical standards of the University of Michigan's Institutional Review Board (UM IRB) and the Helsinki Declaration of 1975, as revised in 2000. The UM IRB approved the study after expedited review and granted an informed consent waiver.

Animal Studies

No nonhuman animal studies were carried out by the authors for this article.

Data Availability

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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Table 1

Demographics, Program Location, and Mental Health Status of Participants in the GC-COV Cohort and the GC-NoCOV Cohort, and Results of Chi-Squared Analyses or Fisher's Exact Test

	GC-COV Cohort (n = 166)	GC-NoCOV Cohort (n = 82)	Comparison Analyses
Participant Demographics, Program			Fisher's

Location, and Mental Health Status	<i>n</i> (%)	<i>n</i> (%)	X^2 (df)	Exact test	<i>p</i>
Gender Identity			.382 (1)		.536
Female	150 (90.4)	76 (92.7)			
Male	16 (9.6)	6 (7.3)			
Racial Background				8.228	.169
Asian	17 (10.3)	4 (4.9)			
Asian Indian	7 (4.2)	1 (1.2)			
Black, African American	3 (1.8)	0 (0.0)			
Middle Eastern, North African	0 (0.0)	1 (1.2)			
Multiracial, Multiethnic	9 (5.4)	7 (8.6)			
White	126 (75.9)	69 (84.1)			
Other	2 (1.2)	0 (0.0)			
Prefer not to answer	2 (1.2)	0 (0.0)			
Hispanic-Origin Status			.519 (1)		.471
Yes	13 (7.8)	4 (4.9)			
No	153 (92.2)	78 (95.1)			
Geographic Region of Grad Program			5.782 (5)		.328
U.S. West	28 (16.9)	9 (11.0)			
U.S. Midwest	55 (33.1)	38 (46.3)			
U.S. South	35 (21.1)	14 (17.1)			
U.S. Northeast	33 (19.9)	12 (14.6)			
Canada	12 (7.2)	8 (9.8)			
Not specified	3 (1.8)	1 (1.2)			
Diagnosed Mental Health Condition			1.160 (1)		.281
Yes	60 (36.2)	36 (43.9)			
No	102 (61.4)	45 (54.9)			

Prefer not to answer

4 (2.4)

1 (1.2)

Note: GC-COV cohort = those who attended graduate school during the COVID-19 pandemic.

GC-NoCOV cohort = those who did not attend graduate school during the COVID-19 pandemic.

U.S. West = AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA, WY; U.S. Midwest = IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI; U.S. South = AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV; U. S. Northeast = CT, MA, ME, NH, NJ, NY, PA, RI, VT

Table 2

Items in Each Factor of Challenges and Their Pattern Matrix Loadings

Factors and Items	Pattern Matrix Loading
Academic & Professional Development (Factor 1)	
1) having opportunities for professional networking	.954
2) mentoring incoming students	.894
3) participating in ceremonies and events within the program	.850
4) having interactions and developing connections with patients	.793
5) building community within the program	.776
6) sharing experiences with classmates	.751
7) experiencing professional growth through program activities	.710
8) learning from diverse patient populations	.695
9) participating in ceremonies and events outside of the program	.663
10) engaging in online learning	.626
11) engaging in educational opportunities	.581
12) getting accurate feedback for clinic assessments	.511
13) feeling prepared for future clinic rotations	.447
Institutional & Program Leadership (Factor 2)	
1) lack of support from institution, program leadership, & faculty	.870
2) asking for support from program leadership and/or faculty	.823
3) voicing concerns to program leadership or faculty	.816

4) lack of resources provided by institution and/or program	.769
5) program's ability to adapt to change	.619
6) ability to fulfill program leadership expectations	.610
Self-Regulation & Resilience (Factor 3)	
1) ability to practice self-care	.772
2) handling stress related to graduate school	.652
3) ability to adapt to changes	.652
4) developing a new sense of normalcy	.617
5) ability to focus in graduate school	.581
6) feeling a sense of personal growth	.579
7) maintaining motivation in graduate school	.574
8) having a personal sense of safety	.447
Financial Stability (Factor 4)	
1) maintaining a steady source of income	.765
2) paying for necessities	.691

Table 3
Linear Mixed-Effects Models Predicting Challenges

Variables	Step 1			Step 2		
	B	95%		B	95%	
		Confidence Interval	<i>p</i>		Confidence Interval	<i>p</i>
(Intercept)	2.266	1.912, 2.620	<.001	1.349	.984, 1.713	<.001

Mental Health Status

(Ref = No Mental

Health Condition)	.222	.031, .413	.022	.270	.096, .444	.002
Intolerance of Uncertainty	.215	.091, .339	.001	.192	.079, .305	.001
Gender (Ref = Female)	-.026	-.354, .301	.874	-.070	-.367, .228	.647
Race (Ref = White)	.048	-.181, .277	.680	.007	-.202, .215	.950
Ethnicity (Ref = Non-Hispanic)	.107	-.265, .478	.573	.072	-.266, .409	.678
Challenge Type (Ref = Academic & Professional Development)			<.001			<.001
Institutional & Program Leadership	-.426	-.587, -.264	<.001	.602	.336, .867	<.001
Self-Regulation & Resilience	.143	-.018, .304	.082	.491	.225, .757	<.001
Financial Stability	-.534	-.696, -.372	<.001	.221	-.044, .487	.101
Cohort (Ref = GC-NoCOV cohort)				1.438	1.171, 1.705	<.001
Challenge Type x Cohort (Ref = Academic & Professional Development; GC-NoCOV cohort)						<.001
Institutional & Program Leadership x GC-COV				-1.516	-1.839, -1.194	<.001
Self-Regulation & Resilience x GC-COV				-.519	-.841, -.196	.002
Financial Stability x GC-COV				-1.116	-1.439, -.793	<.001
Random parts						
AIC	2638.59			2509.31		
ICC _{participants}	.29			.27		

Note: $N = 235$

Table 4

Multiple Linear Regression Models Predicting Psychological Wellbeing for the GC-COV Cohort and the GC-NoCOV Cohort

Variables	Step 1				Step 2			
	B	SE B	β	p	B	SE B	β	p
GC-COV Cohort								
Intercept	5.56	.064		<.001	7.13	.258		<.001
Gender (Ref = Female)	-.210	.177	-.100	.236	-.228	.156	-.109	.146
Race (Ref = White)	-.072	.126	-.047	.568	.091	.111	.060	.414
Ethnicity (Ref = Non-Hispanic)	.024	.201	.010	.907	-.011	.174	-.005	.950
Mental Health Status (Ref = No Mental Health Condition)					-.198	.100	-.149	.050
Intolerance of Uncertainty					-.170	.065	-.199	.010
Academic & Professional Development					-.061	.066	-.076	.357
Institutional & Program Leadership					-.122	.055	-.186	.029
Self-Regulation & Resilience					-.172	.069	-.219	.013
Financial Stability					.018	.039	.036	.644
R^2_{adj}			.01				.25	
F			.62	.605			6.60	<.001
AIC			300.74				261.59	

GC-NoCOV Cohort

Intercept	5.69	.085	<.001	6.67	.321	<.001		
Gender (Ref = Female)	-.035	.301	-.014	.909	-.203	.272	-.083	.459
Race (Ref = White)	-.049	.206	-.029	.814	-.045	.182	-.027	.806
Ethnicity (Ref = Non-Hispanic)	.292	.379	.094	.444	.204	.330	.066	.539
Mental Health Status (Ref = No Mental Health Condition)					-.273	.138	-.218	.052
Intolerance of Uncertainty					.080	.090	.096	.378
Academic & Professional Development					-.131	.131	-.151	.320
Institutional & Program Leadership					-.054	.080	-.090	.501
Self-Regulation & Resilience					-.293	.131	-.328	.029
Financial Stability					.016	.051	.034	.758
R^2_{adj}		.01				.23		
F		.22	.605			3.32		.002
AIC		243.39				127.78		

Note: GC-COV cohort ($n = 150$) = Trained during the COVID-19 pandemic, GC-NoCOV cohort ($n = 72$) = Did not train during the COVID-19 pandemic