

Impact of a Virtual Professional Development Coaching Program on the Professional Fulfillment and Well-Being of Women Surgery Residents: A Randomized Controlled Trial

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Key Points

Question: What is the effect of a virtual coaching program on the well-being of women surgery residents in a surgical society?

Findings: In this randomized trial involving 237 women surgery residents, those who received coaching demonstrated improvement in specific measures of well-being relative to those who did not, including the PERMA scale ($p=0.015$) and Intolerance of Uncertainty scale ($p=0.015$). Although burnout and professional fulfillment significantly improved with coaching, no significant difference was found between groups in these measures.

Meaning: A remote coaching program may improve women surgery resident well-being in certain domains; however, impact on fulfillment and burnout is unclear.

Objective: Evaluate the effect of a virtual coaching program offered to women surgery residents in a surgical society.

Summary Background Data Randomized controlled experiments evaluating the effect of coaching on trainee well-being and burnout is lacking.

Methods : Women surgery residents in the Association of Women Surgeons were recruited to participate in a randomized controlled trial of the effects of a virtual coaching program on trainee well-being. Attending surgeons served as coaches after completing in-person training. Residents (n=237) were randomized to intervention (three 1:1 coaching sessions over 9 months) or control (emailed wellness resources). Participants were surveyed at baseline and post-intervention using validated measures of well-being, burnout, and resilience. Changes in outcome measures between pre- and post-survey were compared between study arms.

Results Survey response rates were 56.9% (n=66) in the control group and 69.4% (n=84) in the intervention group (p=0.05). The intervention group showed significant improvement in professional fulfillment (p=0.021), burnout (0.026), work exhaustion (0.017), self-valuation (0.003), and well-being (p=.002); whereas the control group showed significant improvement in self-valuation (p=0.015) and significant decline in resilience (p=0.025). The intervention group had a significant improvement in well-being (p=0.015) and intolerance of uncertainty (p=0.015) compared to controls.

Conclusions Women surgery residents who participated in a remote coaching program offered by a surgical society demonstrated improvement in aspects of well-being relative to peers who did not receive coaching. Therefore, remote coaching offered by a professional society may be a useful component of initiatives directed at trainee well-being.

INTRODUCTION

Burnout is highly prevalent among resident physicians; women surgical trainees manifest particularly high rates of burnout.¹ Gender bias, work-life integration challenges, anticipation of pay inequity, and challenges of finding effective mentorship all contribute to higher rates of burnout and less professional well-being among women surgical trainees.²⁻⁴ There is increasing attention to well-being in this particular population and professional development coaching is one intervention that has been shown to improve physician well-being.⁵

Recent studies have demonstrated that residents who participated in a structured coaching program reported decreased emotional exhaustion and improved goal setting, self-reflection practices, coping skills and ability to establish meaningful relationships.⁶⁻⁸ This research has been conducted in cohort studies; evidence from randomized controlled studies is needed.

Coaching and mentoring programs are frequently conducted in the context of in-person interactions between a faculty member and trainee at the same institution; this approach may be limited to well-resourced institutions with larger programs.⁶⁻⁹ Coordinating such programs within professional organizations nationally or regionally may overcome challenges of local scale, and allow for further innovation, such as virtual coaching to connect physicians.

To assess the impact of coaching on trainee well-being, we completed a randomized controlled trial of women surgery residents through the Association of Women Surgeons (AWS). Here, we report the impact of coaching on women surgery residents who received virtual professional development coaching relative to matched controls who did not receive coaching using several validated instruments that address professional fulfillment, burnout, self-valuation, intolerance of uncertainty, and resilience.

METHODS

A randomized controlled trial was performed to evaluate the effects of coaching on well-being, fulfillment, self-valuation, and burnout among resident members of AWS from 2018-2020. The research protocol and all research materials and methods were approved by the Mass General Brigham Institutional Review Board (Protocol #: 2017P00056) and funded through a grant from The Physicians Foundation.

AWS is a global professional surgical society whose mission is to “to inspire, encourage, and enable women surgeons to realize their professional and personal goals.”¹⁰ Concordant with its mission, the organization launched a program in which practicing surgeons volunteered to be trained in positive psychology coaching and paired with women surgery trainees in a virtual coaching relationship.

Participants, randomization and outcome measures

Members of AWS were recruited to participate in the study as coaches (attending surgeons) or coachees (residents) via direct email and social media. Coaches were required to be members of AWS, be actively engaged in a surgery or surgery subspecialty practice, and reside in the United States (US) or Canada. Coachees were also members of AWS, residents of the US and Canada, and actively engaged in residency training for the duration of the program.

All participants (coaches and coachees) were required to complete a baseline questionnaire including informed consent, demographics, Professional Fulfillment Index (PFI), Self-Valuation; Positive Emotion, Engagement, Relationship, Meaning, and Accomplishment scale (PERMA), Intolerance of Uncertainty scale (IUS), and Hardiness Resilience Score (HRS).¹¹⁻¹⁵ Participant’s region was determined using self-reported state as laid out in the US Census Divisions.¹⁶ Field of specialty or prospective specialty was also noted. The participating surgery residents were then randomized to the intervention group or the control group based on

the PFI's burnout sub-scale's quartile scores at pre-survey. After the 9-month study period, all participants received a follow-up questionnaire similar to the baseline questionnaire. Those who completed the follow-up questionnaire received a digital \$10 gift card to an online shopping vendor as remuneration.

Intervention – The AWS Coaching Project

Participating coaches completed a 3-hour, in-person coaching training program at the 2018 and 2019 AWS national meetings. Coaching materials were created by a subject matter expert (SME, author K.P.) in conjunction with the Institute of Coaching at McLean. The interactive training sessions were led by the SME and emphasized principles of positive psychology, creating an effective coaching presence, and core coaching skills of reflective listening, goal setting, and asking future-oriented questions rather than giving advice. Coaches received a manual developed for this program with step-by-step guidelines for three coaching meetings. Each meeting was expected to be 45-60 minutes in length. Coaches were also invited to participate in two additional optional 90-minute refresher training sessions, offered virtually over a web-based video platform. Meetings were focused on setting a vision for success for the year, strengths identification, what provides and drains energy, personalizing the PERMA construct, and work-life integration. Unique aspects of the curriculum tailored to the study population included discussion of imposter syndrome, the glass ceiling, and microaggressions although residents were welcome to discuss any aspect of their professional or personal life important to them. Additional details regarding coach training and the program are published separately.^{6,7,9}

Upon completion of training, each coach was paired with 1-2 residents who were randomized to the coaching intervention group. Coach-coachee pairings were constructed based

on divergent surgical specialty and geographic location to create a safe space and minimize the possibility of a more traditional mentoring relationship. Self-identification demographics such as age, race and ethnicity were not used when matching, as numbers were small and priority was given to pairing residents with coaches outside of their field of interest and institution. All coaching sessions occurred virtually over voice or video calls. Participants were encouraged to meet for at least 3 coaching sessions over the 9-month intervention period but could meet more frequently if amenable to both parties.

Residents in the control group received three emails across the 9-month study period containing materials related to physician well-being such as resilience, mindfulness, and work life-integration. Materials included readings, videos, and exercises that were curated by members of AWS who were not involved in the coaching program. These materials were not shared with the intervention group.

Outcomes

Study outcome measures included: validated PFI subscale for professional fulfillment (5 point Likert scale [from Not at all (0) to Completely true (4)], 6 items), PFI subscale for burnout as combination of work exhaustion and interpersonal disengagement (5 point Likert scale from Not At All (0) to Extremely (4)], 10 items, range 0-4), Self-Valuation (5 point Likert scale [from Never (4) to Always (0)], 4 items, range 0-4); and PERMA overall score (5 point frequency[1-5], 15 items, range 0-75). Program outcome measures included: Intolerance of Uncertainty score (IUS, 5 point frequency[1-5], 12 items, range 0-60); Hardiness-resilience score (HRS/DRS-15, 4 point frequency[0-3], 15 items, range 0-45); Gratitude score (7 point frequency[1-7], 2 items from the GQ-6 scale, range 0-14) and Measurement of Current Status score (MOCS, 5 point frequency[1-5], 3 items from MOCS part A, range 0-15). Quality of Communication was

measured using a 4-point global rating (poor, fair, good, excellent). PFI and Self-Valuation scores are calculated as the average of the scoring items while all other scores are summed across items.^{11–15,17,18}

Statistical methods

Participant demographics and characteristics are summarized for those who responded to the baseline survey and those who responded to both the baseline and follow-up surveys. To assess the difference in outcomes, our analysis was limited to participants who answered both baseline and follow-up survey. For continuous scoring outcomes such as PFI, Self-Valuation and PERMA, we summarized the measures using mean and standard deviation, tested for difference using paired t-tests, and calculated Cohen's d to evaluate effect size. We employed McNemar's tests for dichotomized categorical responses including reflection and receiving feedback, and scoring measures including HRS, IUS, MOCS, and gratitude. These scoring measures were dichotomized at the median based on the quartiles created using the pre-survey scores from both study arms combined. Linear regression models were used to examine dose-response relationship between number of meetings with study outcomes; standardized β coefficients were estimated to evaluate effect size. A two-sided p-value < 0.05 was considered statistically significant. All analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC).

RESULTS

Of the 237 study participants, 66 of 116 (56.9%) responded to the post-survey in the control group while 84 of 121 (69.4%) responded in the intervention group ($p=0.05$).

Demographics and characteristics were not statistically different between the control and intervention group (Table 1). Respondents were 30.5 years old on average and were 68.3% White, 20.4% Asian, 6.1% African-American, 4.3% Mixed Race and 7.7% Hispanic. A greater

majority were located in the Southern region of US (38.8%) while only a few from the Western region (3.4%). Most planned on specializing (43.5%). Respondents were more likely to be in their Research Year or PGY-1 (19.8%) compared to any other post graduate year (PGY). Of the 84 respondents in the intervention arm, 80% met with their coach at least once, 63% met at least twice, and 49% had three or more meetings. Meeting data was missing for 8% of respondents.

For the PFI, Self-Valuation, and PERMA outcome measures, there was a significant improvement between the pre and post survey in the intervention group (Table 2). There was an increase in professional fulfillment [mean (SD) pre 2.33(0.67) vs post 2.52(0.77) $p=0.021$; Cohen's $d=0.26$], self-valuation [mean (SD) pre 1.42(0.71) vs post 1.75(0.82) $p=0.0003$; Cohen's $d=0.35$], and PERMA overall score [mean (SD) pre 55.47(7.60) vs post 58.05(7.90) $p=0.002$; Cohen's $d=0.37$]; and a decrease in burnout [mean (SD) pre 1.39(0.68) vs post 1.19(0.58) $p=0.026$; Cohen's $d=-0.26$], and its two components - work exhaustion [mean (SD) pre 1.72(0.78) vs post 1.48(0.67) $p=0.017$; Cohen's $d=-0.27$] and interpersonal disengagement [mean (SD) pre 1.17(0.71) vs post 1.00(0.62) $p=0.071$; Cohen's $d=-0.21$]. No significant change was seen in the control arm except for self-valuation, which increased from pre to post [mean (SD) pre 1.50(0.69) vs post 1.72(0.89) $p=0.015$; Cohen's $d=0.32$]. The change in pre and post scores for each study arm for PFI, Self-Valuation and PERMA scores are also shown in Figure 1.

To account for differential response bias, post-survey responses were analyzed based on the difference-in-difference results for outcome measures (Table 2). For the PFI professional fulfillment score, the increase in the intervention arm compared to stagnation in the control arm was not statistically significant (0.20 vs -0.01, $p=0.11$; Cohen's $d=0.27$). Similarly, the decline in PFI burnout scores in the intervention arm compared to the control arm did not reach statistical

significance (-0.20 vs 0.01, $p=0.088$; Cohen's $d=-0.29$). There were no significant differences in change in self-valuation scores between the two groups. We observed a significant difference-in-difference for PERMA as the intervention arm improved from 55.5 to 58.0 while the control arm remained unchanged ($p=0.015$; Cohen's $d=0.43$).

We found significant dose-response effect associated with incremental increase in the number of meetings – for every additional meeting, PFI increased by .17 units (standardized $\beta = .31$, $P = .003$); Burnout score decreased by .14 units (standardized $\beta = .36$, $P = .002$); PERMA score increased by 1.33 units (standardized $\beta = .25$, $P = .036$); HRS increased by .89 units (standardized $\beta = .27$, $P = .019$); and Quality of Communication increased by .49 units (standardized $\beta = .71$, $P < .001$). Overall, these findings consistently indicate moderate to large standardized effects sizes on outcomes for increase in the number of meetings. There was no significant dose-response effect for increase in # meetings and self-valuation ($\beta = .23$, $P = .068$).

Program outcomes measures expected to change based on coaching are shown in Table 3. Opportunity to reflect significantly improved in the coaching arm from 54.8% who reported good or excellent reflection at baseline to 77.1% in follow-up ($p=0.0004$). Improvement in reflection was not seen in the control arm (66.7% to 69.7%, $p=0.69$), which was significantly different between the two arms ($p=0.057$). HRS and IUS had contrasting trajectories in the two arms. For hardiness/resilience, the percentage of participants who were in the higher HRS group reduced from 46.0% to 32.8% ($p=0.025$) in the control arm while there was no significant change in the intervention group. Improvement in intolerance of uncertainty (shown as a reduction in IUS score) was evident in the intervention group (53.0% to 40.8%); whereas in the control arm the number of those with higher IUS increased from 47.7% to 57.4% (difference in difference p -value was 0.015).

Lastly, participants were asked in the pre-survey how their respective residency program helped them cope with specific stressors of residency (Table 4). In the post-survey, participants were asked how helpful their experience was (control group - information emails; intervention group – coaching) in coping with these same stressors. The control group did not feel the information emails were helpful; more than half of residents answered unsure for these items. The intervention group reported that coaching significantly helped with work-life balance (48.8% to 75.3%; $p < 0.0001$), working relationships (69.9% to 75.3%; $p = 0.002$), administrative burdens (39.8% to 54.5%; $p = 0.0002$), and self-confidence (45.8% to 83.1% $p < .0001$).

DISCUSSION

In this randomized controlled trial, women surgery residents who received professional development coaching demonstrated significant improvement in well-being as measured by the PERMA scale and improved tolerance of uncertainty (IUS) compared to controls. Additionally, there was a significant decline in resilience for the control group that was not seen in the intervention group. Residents who experienced coaching reported benefits that may have supported their resilience during the challenges of residency, such as improved reflective practice and coping with stressors such as work-life balance, administrative burdens, workplace relationships, and self-confidence. In support of this is the finding that there was a significant dose-response effect associated with number of meetings and PFI, burnout, PERMA, HRS, and quality of communication.

While burnout and professional fulfillment improved significantly within the intervention group, we did not find these differences to be significant between the intervention group and controls. Interestingly, self-valuation increased in both groups. We hypothesize that this may be due to increased clinical competence that may naturally occur during the course of the academic

year. Coaching may augment this by promoting reflection, strengths awareness, and goal setting behaviors. It is also possible that emails containing materials related to resilience, mindfulness, work life-integration, and awareness about the importance of self-care in physician well-being might have resulted in improved self-valuation scores in the control group. Further studies are needed to examine the effectiveness of email interventions on self-valuation.

Prior uncontrolled studies have demonstrated the benefits of coaching on trainees' perception of emotional exhaustion, improved residency experiences, and increased opportunities to reflect on their performance and set goals.⁵⁻⁸ The randomized controlled trial design in this study permits more robust comparison to generate insight into the potential impact of coaching. For example, we demonstrated that residents who received coaching retained higher scores in resilience, while residents who did not receive coaching exhibited a decline in these scores. Evaluation of coached residents alone would not have revealed how coaching may buffer trainees against an erosion of positive skills or attributes in certain domains of well-being. The importance of this finding is augmented by recently published multivariate analyses of coached cohorts, which highlighted that higher resilience and lower intolerance of uncertainty were correlated with lower emotional exhaustion.⁹

These data strengthens prior findings on the ability to achieve positive coaching outcomes using novice volunteer faculty coaches with minimal training. This approach is cost-effective compared to hiring professional certified coaches.¹⁹ The pairing of coaches and coachees in disparate locations and mismatching specialties helped to differentiate this interaction from traditional mentorship and create a safe space for exploration of their experiences and concerns. Coaches were not involved or knowledgeable about the details of their resident's program or performance, allowing them to concentrate on coaching skills such as

reflective listening and appreciative inquiry. This approach invites the resident to identify solutions to her own problems and build self-efficacy, rather than being given advice.⁵

This study demonstrates the effectiveness of a coaching program that was administered virtually by a surgery society, pairing faculty coaches with trainees at geographically distinct sites. This approach offers an appealing alternative, allowing a broader range of trainees to be offered participation rather than limiting coaching opportunities to trainees at large institutions with the resources to develop a coaching program. Likewise, coaches could be recruited on a national basis, including from hospitals without residency programs. Perhaps most importantly, this program provides an evidence-based well-being intervention to all trainees. This is particularly useful for those who train at institutions where well-being programming is undervalued, who may be at greatest need of coaching and least likely to receive it locally.

Initially, the purpose of the virtual design was to provide coaching to a wide range of trainees nationally who might lack resources from their home environment. The unforeseen consequences of the COVID-19 pandemic, occurring as it did during the second year of the trial, revealed a secondary purpose in that the virtual nature of the program was ideally suited for these times, compared to an in-person coaching program which would have been disrupted. Additionally, surgery residents and attendings continued to meet despite facing intense stressors. Given the expectation of continued stressors during the COVID-19 recovery phase, it is timely that this coaching intervention can be delivered virtually and has demonstrated enhanced coping with specific stressors of residency.

The baseline burnout and professional fulfillment for both groups as well as post in the control group are similar to those reported nationally for surgical specialty.²⁰ The lack of difference in burnout and professional fulfillment between the intervention and control groups

suggests that there may be additional systems-level factors influencing resident experience that may not be fully addressed through virtual coaching, or may not be addressed meaningfully in three coaching meetings. These inherent systems-level challenges will be important to address in future well-being interventions in this population.

Limitations

This study has several limitations, including the generalizability and reproducibility of the study results. The participants were all women surgery residents, a trainee group that may be particularly prone to workplace stressors. Other groups of trainees may not benefit from a coaching program in the same way. There may be self-selection into the study, as all residents and faculty who volunteered to participate in the study may not be representative of women surgeons nationally. There was moderate attrition in survey participation from baseline to follow-up. Our analysis suggests that the respondents and non-respondents were similar other than with respect to PGY-level, which limits the risk of non-responder bias. Regarding training level, the population of respondents was enriched in research residents. Identifying ways to proactively support participation in such programs may improve program engagement and impact at all levels. The study size was modest with limited power to discern fine differences between the intervention and control groups. There were small to moderate effect sizes for all significant findings reported, although the impact of these changes on an individual's experience is unknown and may in fact be quite variable. A qualitative evaluation in future studies to understand how meaningful these changes are may be useful. The intervention itself may be difficult to standardize, as each coach-coachee dyad may have had a distinct relational dynamic or have discussed topics specific to the needs of each coachee. However, the flexibility of the

coaching intervention is simultaneously a strength as it permits a tailored coaching experience targeted to the needs of the coachee rather than a rigid curriculum.

Future Work

Additional studies are needed to further understand the potential of virtual coaching for residents, including the long-term effects of coaching and how the results described in the current study translate to durable benefits to both coach and coachee participants. It will be crucial to understand how the efforts of AWS can be expanded to extend the benefits of coaching further. For example, the American Pediatric Surgical Association, inspired by the AWS program, has implemented a similar program targeting pediatric surgery fellows with evaluation underway. Additionally, virtual coaching may offer benefits other times in one's career, such as medical students, fellows, or junior and mid-career faculty.^{19,21} Finally, evaluating the fidelity of the intervention will be helpful to understand how effectively faculty are able to adhere to the coach approach.

Conclusion

A virtual coaching program administered by a surgical society may improve the experience of women surgery trainees, specifically in the domains of professional fulfillment, well-being, resilience, tolerance of uncertainty, and work-life balance. This intervention may be useful for organizations aiming to improve the clinical learning environment. Partnering with professional societies may serve as an effective way to increase the opportunity for trainees to receive coaching, and future work may focus on how to best scale such a program or incorporate coaching alongside other well-being initiatives.

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Abbreviations

AWS = Association of Women Surgeons

US = United States

PFI = Professional Fulfillment Index

PERMA = Positive Emotion, Engagement, Relationship, Meaning, and Accomplishment

IUS = Intolerance of Uncertainty

HRS = Hardiness Resilience Score

DRS-15 = Dispositional-resilience Scale-15

GR-2 = 2 question Gratitude Questionnaire

GQ-6 = 6 question Gratitude Questionnaire

MOCS3 = Measurement of Current Status

PGY = Post Graduate Year

ACCEPTED

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Table 1: Participant Demographics and Characteristics for Respondents and Non-Respondents

Surgical specialties include: trauma, general, general subspecialty (colorectal, endocrine, breast, minimally invasive, transplant, surgical oncology), cardiac/thoracic vascular, and subspecialty (urology, plastics, ortho, neuro). *Missing Age(6), Race (7), Ethnicity (4)

	All	Control		P	Intervention		P
		Respondents	Non-Respondents		Respondents	Non-Respondents	
N	237	66	50		84	37	
Age*, Mean (SD)	30.5 (3.0)	30.7 (2.9)	30.3 (2.7)	0.42	30.3 (3.0)	30.9 (3.2)	0.34
Race*, N (%)				0.070			0.58
American Indian or Alaskan Native	1 (0.4)	0 (0.0)	0 (0.0)		0 (0.0)	1 (2.9)	
Asian	47 (20.4)	12 (18.2)	16 (34.8)		14 (16.9)	5 (14.3)	
Black, or African American	14 (6.1)	4 (6.1)	5 (10.9)		3 (3.6)	2 (5.7)	
White	157 (68.3)	49 (74.2)	23 (50.0)		61 (73.5)	24 (68.6)	
More than one race	10 (4.3)	1 (1.5)	2 (4.3)		4 (4.8)	3 (8.6)	
Other	1 (0.4)	0 (0.0)	0 (0.0)		1 (1.2)	0 (0.0)	
Ethnicity*, N (%)				0.083			0.44
Hispanic	18 (7.7)	59 (89.4)	46 (97.9)		75 (90.4)	35 (94.6)	
Non-Hispanic	215 (92.3)	7 (10.6)	1 (2.1)		8 (9.6)	2 (5.4)	
Region, N (%)				0.32			0.64
Northeast	69 (29.1)	14 (21.2)	16 (32.0)		28 (33.3)	11 (29.7)	
Midwest	62 (26.2)	21 (31.8)	17 (34.0)		18 (21.4)	6 (16.2)	
South	92 (38.8)	27 (40.9)	15 (30.0)		34 (40.5)	16 (43.2)	
West	8 (3.4)	4 (6.1)	1 (2.0)		1 (1.2)	2 (5.4)	
Outside of US (Canada)	6 (2.5)	0 (0.0)	1 (2.0)		3 (3.6)	2 (5.4)	
Specialty, N (%)				0.43			0.60
ACS/Trauma	33 (13.9)	7 (10.6)	7 (14.0)		14 (16.7)	5 (13.5)	
Non-General Specialty	11 (4.6)	2 (3.0)	3 (6.0)		4 (4.8)	2 (5.4)	
Surgery Subspecialty	103 (43.5)	34 (51.5)	16 (32.0)		33 (39.3)	20 (54.1)	
Cardiothoracic/Vascular	27 (11.4)	6 (9.1)	8 (16.0)		9 (10.7)	4 (10.8)	
General	42 (17.7)	14 (21.2)	13 (26.0)		11 (13.1)	4 (10.8)	

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Undecided	21 (8.9)	3 (4.5)	3 (6.0)		13 (15.5)	2 (5.4)	
PGY				0.00 7			0.3 5
PGY1	47 (19.8)	5 (7.6)	14 (28.0)		17 (20.2)	11 (29.7)	
PGY2	37 (15.6)	12 (18.2)	9 (18.0)		13 (15.5)	3 (8.1)	
PGY3	39 (16.5)	12 (18.2)	3 (6.0)		16 (19.0)	8 (21.6)	
PGY4	33 (13.9)	10 (15.2)	8 (16.0)		8 (9.5)	7 (18.9)	
PGY5+	34 (14.3)	6 (9.1)	9 (18.0)		15 (17.9)	4 (10.8)	
Research	47 (19.8)	21 (31.8)	7 (14.0)		15 (17.9)	4 (10.8)	

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Table 2. Summary of Professional Fulfillment, Self-Valuation, and PERMA scores

For PFI and PERMA outcome measures, there was a significant improvement between the pre and post survey in the intervention group. No significant change was seen in the control arm except for self-valuation. A significant difference of change in PERMA was observed when comparing two study groups.

*DID=Difference-in-Difference Test

**Cohen's d effect size

	Control (N=66)				Intervention (N=84)				DID*
	Pre	Post	Change	Effect Size**	Pre	Post	Change	Effect Size**	p
PFI Professional Fulfillment									0.11
Mean (SD)	2.28 (0.67)	2.26 (0.87)	-0.01 (0.82)	0.01	2.33 (0.67)	2.52 (0.77)	0.20 (0.76)	0.26	
Missing	0	1	p=0.90		0	2	p=0.021		
PFI Burnout									0.088
Mean (SD)	1.37 (0.59)	1.39 (0.72)	0.01 (0.68)	0.01	1.39 (0.68)	1.19 (0.58)	-0.20 (0.78)	0.26	
Missing	0	4	p=0.90		2	4	p=0.026		
Work Exhaustion									0.15
Mean (SD)	1.69 (0.62)	1.65 (0.76)	-0.04 (0.73)	0.05	1.72 (0.78)	1.48 (0.67)	-0.23 (0.82)	0.28	
Missing	0	1	p=0.67		1	4	p=0.017		
Interpersonal Disengagement									0.10
Mean (SD)	1.16 (0.66)	1.21 (0.78)	0.04 (0.74)	0.05	1.17 (0.71)	1.00 (0.62)	-0.18 (0.87)	0.21	
Missing	0	2	p=0.63		2	4	p=0.071		
Self-valuation									0.54
Mean (SD)	1.50 (0.69)	1.72 (0.89)	0.23 (0.70)	0.33	1.42 (0.71)	1.75 (0.82)	0.31 (0.87)	0.36	
Missing	0	5	p=0.015		1	6	p=0.0003		
PERMA									0.015
Mean (SD)	56.08 (6.47)	56.18 (7.91)	-0.52 (7.41)	0.07	55.47 (7.60)	58.05 (7.90)	2.64 (7.20)	0.37	
Missing	2	6	p=0.60		1	8	p=0.002		

Table 3. Summary of Survey Responses and Related Score Measures

Program outcomes measures improved for those in the coaching intervention group overall, but stayed the same or worsened for those in the control group. The contrast is mainly observed in the IUS score, where decrease in IUS indicate improvement.

*DID=Difference-in-Difference Test

**% Change for top response category (good/excellent or high)

	Control (N=66)				Intervention (N=84)				DID*
	Pre	Post	% Change* *	p	Pre	Post	% Change**	p	
Opportunity to Reflect on Experiences, N(%)									0.057
Poor/Fair	22 (33.3)	20 (30.3)		0.690	38 (45.2)	19 (22.9)		< .001	
Good/Excellent	44 (66.7)	46 (69.7)	-3.0		46 (54.8)	64 (77.1)	22.3		
Hardiness-Resilience Score (HRS), N(%)									0.076
Low (Q1-Q2)	34 (54.0)	41 (67.2)		0.025	41 (51.3)	35 (47.9)		0.617	
High (Q3-Q4)	29 (46.0)	20 (32.8)	-13.2		39 (48.8)	38 (52.1)	3.3		
Intolerance of Uncertainty Score (IUS), N(%)									0.015
Low (Q1-Q2)	34 (52.3)	26 (42.6)		0.467	39 (47.0)	45 (59.2)		0.074	
High (Q3-Q4)	31 (47.7)	35 (57.4)	9.7		44 (53.0)	31 (40.8)	-12.2		
Measure of Current Status Score (MOCS), N(%)									0.441
Low (Q1-Q2)	33 (50.0)	31 (50.0)		0.808	43 (51.8)	35 (44.9)		0.297	
High (Q3-Q4)	33 (50.0)	31 (50.0)	0.0		40 (48.2)	43 (55.1)	6.9		
Gratitude Score, N(%)									0.111
Low (Q1-Q2)	31 (47.0)	24 (38.7)		0.285	29 (34.9)	31 (39.7)		0.346	
High (Q3-Q4)	35 (53.0)	38 (61.3)	8.3		54 (65.1)	47 (60.3)	-4.8		

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Table 4. Summary of Program Measures

Assessment of how the coaching program versus information emails assist with coping with specific stressors of residency.

*DID=Difference-in-Difference Test

**% Change for top response category (good/excellent or high)

	Control (N=66)				Intervention (N=84)				DID*
	Pre	Post	% Change**	p	Pre	Post	% Change**	p	
Does the residency (pre) coaching program/pamphlets help with:									
Information processing, N(%)									0.026
Definitely/Somewhat Yes	40 (60.6)	7 (12.3)	-48.3	< .001	53 (63.9)	46 (59.7)	-4.2	0.119	
Definitely/Somewhat No	16 (24.2)	14 (24.6)			23 (27.7)	15 (19.5)			
Unsure	10 (15.2)	36 (63.2)			7 (8.4)	16 (20.8)			
Work-life balance, N(%)									< .001
Definitely/Somewhat Yes	25 (37.9)	13 (22.4)	-15.5	< .001	40 (48.8)	58 (75.3)	26.5	< .001	
Definitely/Somewhat No	40 (60.6)	11 (19.0)			42 (51.2)	10 (13.0)			
Unsure	1 (1.5)	34 (58.6)			0 (0.0)	9 (11.7)			
Cultural competence, N(%)									0.013
Definitely/Somewhat Yes	38 (57.6)	8 (13.8)	-43.8	< .001	47 (57.3)	32 (41.6)	-15.7	< .001	
Definitely/Somewhat No	23 (34.8)	12 (20.7)			22 (40.2)	22 (28.6)			
Unsure	5 (7.6)	38 (65.5)			2 (2.4)	23 (29.9)			
Working relationships, N(%)									0.001
Definitely/Somewhat Yes	44 (66.7)	12 (20.7)	-53.7	< .001	58 (69.9)	58 (75.3)	5.4	0.002	
Definitely/Somewhat No	18 (27.3)	11 (19.0)			24 (28.9)	9 (11.7)			
Unsure	4 (6.1)	35 (60.3)			1 (1.2)	10 (13.0)			
Administrative burdens, N(%)									0.043

Definitely/Somewhat Yes	29 (43.9)	3 (5.2)	-49.1	< .00 1	33 (39.8)	42 (54.5)	14.7	< .001		
Definitely/Somewhat No	35 (53.0)	18 (31.0)			48 (57.8)	19 (24.7)				
Unsure	2 (3.0)	37 (63.8)			2 (2.4)	16 (20.8)				
Self-confidence, N(%)									0.00 4	
Definitely/Somewhat Yes	28 (42.4)	14 (24.1)	-18.3	< .00 1	38 (45.8)	64 (83.1)	37.3	< .001		
Definitely/Somewhat No	34 (51.5)	9 (15.5)			45 (54.2)	5 (6.5)				
Unsure	4 (6.1)	35 (60.3)			0 (0.0)	8 (10.4)				

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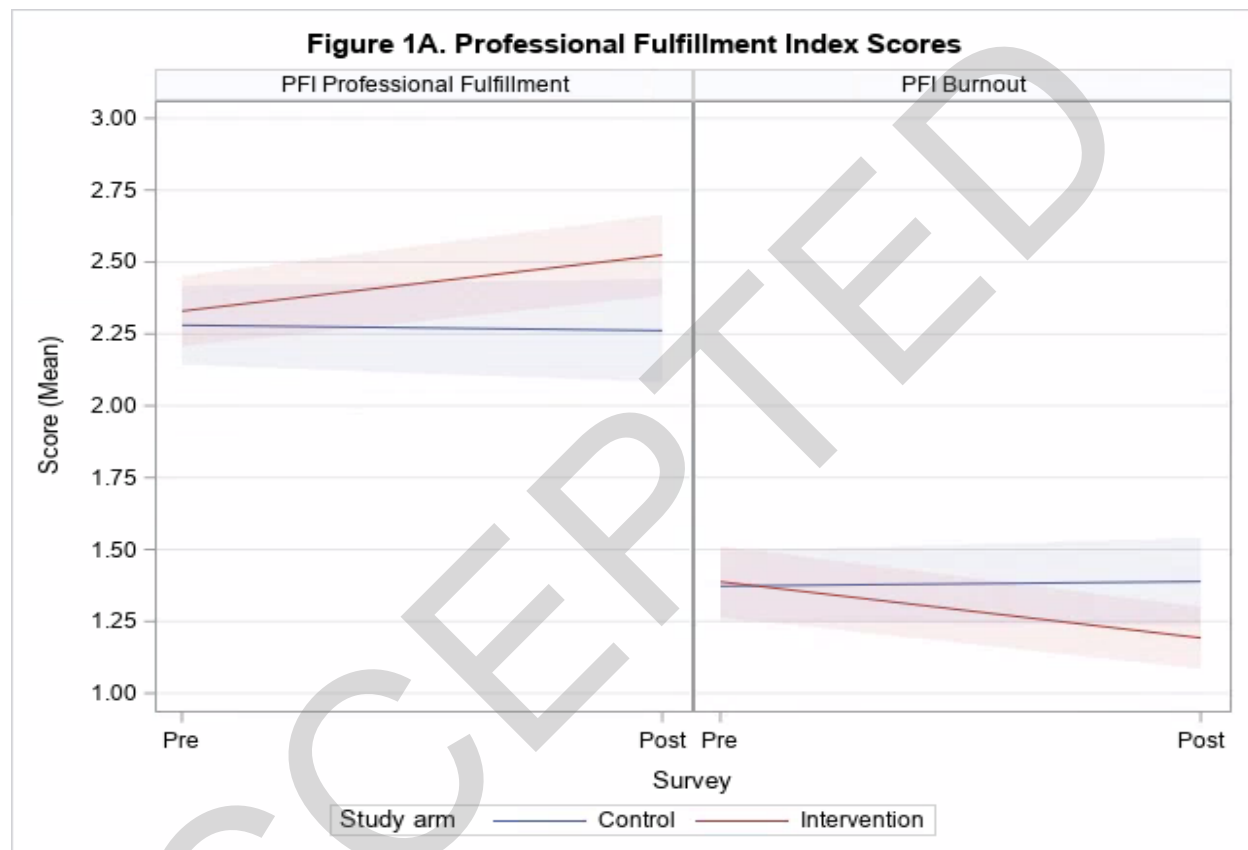
Figure 1: Professional Fulfillment Index, Self-Valuation, and PERMA Scores

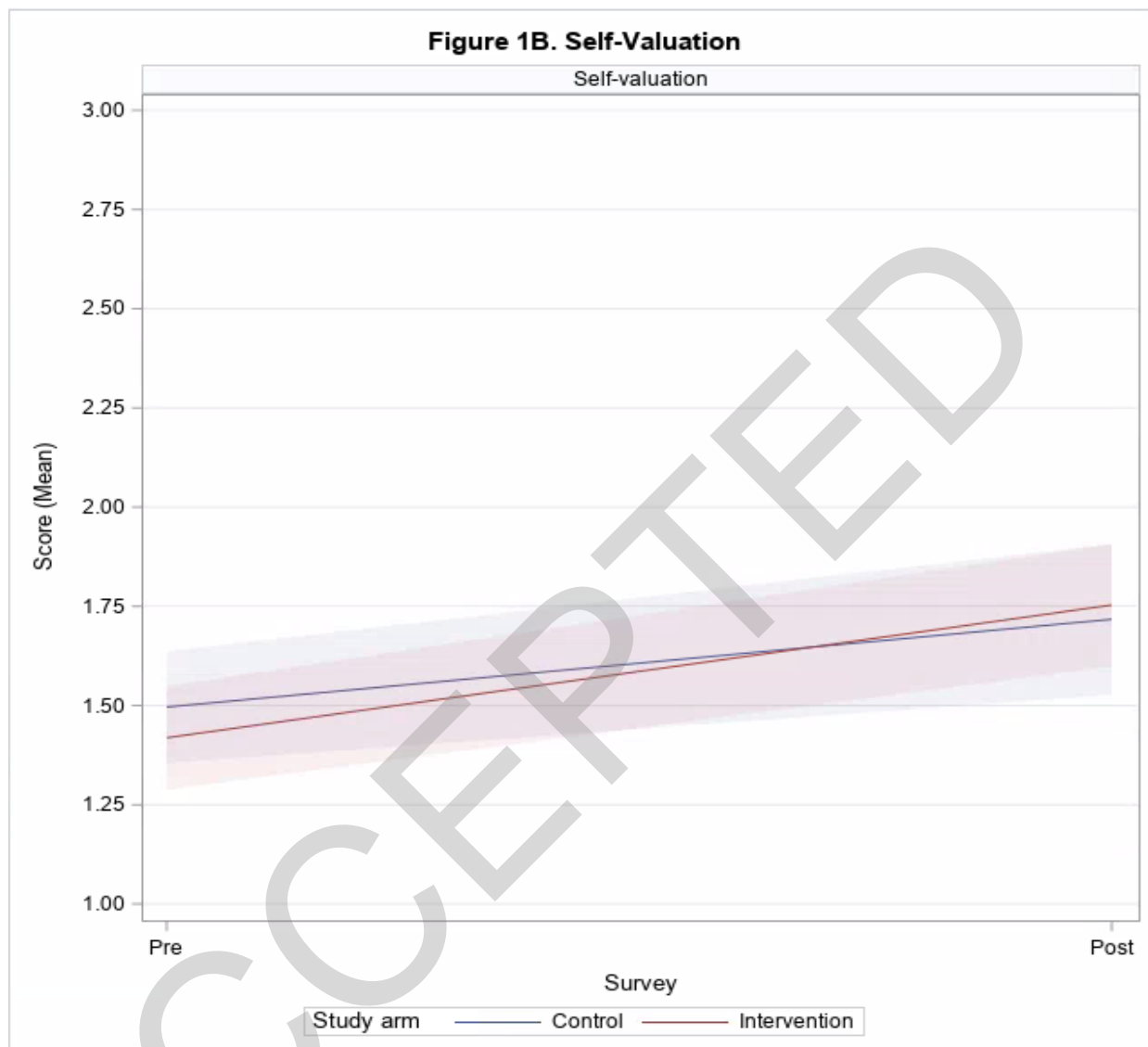
Visual depiction of mean change in PFI, self-valuation, and PERMA scores for each study group. More increase in PFI professional fulfillment, PFI self-valuation, PERMA and decrease in PFI burnout observed for intervention group.

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Figure 1: Professional Fulfillment Index, Self-Valuation, and PERMA Scores

Visual depiction of mean change in PFI, self-valuation, and PERMA scores for each study group. More increase in PFI professional fulfillment, PFI self-valuation, PERMA and decrease in PFI burnout observed for intervention group.





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