ORIGINAL RESEARCH ARTICLE

Association of residents' personality traits with clinical performance in an orthopedic physical therapy residency program

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Abstract

Purpose: Despite the lack of validity and reliability, residency programs use various assessments to admit residents and anticipate their future performance that include admission interviews and letters of recommendation. The purpose of this study is to examine whether there is a valid, reliable, or predictive association between physical therapy residents' personality traits and their clinical performance in the domains of live patient examination, clinical productivity, and patient satisfaction during residency training.

Methods: This study was an observational cohort study. Each resident completed a standardized 16 Personal Factors Questionnaire (16 PF) on their respective hire date prior to matriculation in the physical therapy residency program.

Results: Results of the Spearman's rho correlation indicated there was a strong positive association between those residents who were classified as more even-keeled ($r = 0.473$; $p = 0.02$) and meeting clinical productivity goals at 3 months. Better performance on the live patient examination was associated with residents who were identified as being people-oriented ($r = 0.531$; $p = 0.02$), gregarious ($r = 0.464$; $p = 0.04$), and fearless ($r = 0.521$; $p = 0.02$), while worse performance was associated with residents who were self-disclosing ($r = -0.673$; $p = 0.00$) and self-confident ($r = -0.520$; $p = 0.02$).

Conclusions: Identification of residents' personality traits may be helpful in determining whether residents are likely to meet expectations in the domains of clinical productivity and performance on a live patient examination during the first 3 months of a post-professional physical therapy residency program.

MeSH terms: *cohort studies*; *post-professional education*; *orthopedics*

Keywords: *physical therapist*; *residency training personality traits*; *orthopedics*

Physical therapy residency programs are intensive, post-professional training programs designed to provide advanced clinical skills in a specialized area of practice.[1] The requirements of residency programs often include a significant number of clinical and mentoring hours, teaching requirements, and participation in research activities. The demands of residency programs often involve the resident managing the expectations of the rigors of clinical practice while also navigating the challenges of an intensive academic curriculum. Residency programs often equate resident success with the resident advancing toward clinical excellence through the achievement of expected milestones, core competencies, and graduation from the program.[1,2]

When deciding to admit residents, physical therapy residency programs rely on information pertaining to applicants' past academic performance as indicators of residents' future performance in the program. Commonly used indicators of past performance include clinical rotation grades, relevant experience, leadership qualities, and interview performance.[3–7] While program directors may rely on these indicators of past performance, these

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indicators have not been associated with future clinical performance. Indeed, evidence does not support the validity, reliability, and predictive capacity of those indicators for physicians.[3–6] Intellectual abilities alone account for roughly 35% of performance variance among physicians, but when personality factors are included, the common variance increases to 75%.[7–9]

In medical literature, both cognitive abilities (e.g. intelligence) and noncognitive factors (e.g. personality) have been assessed to estimate physician performance in medical residency training programs.[10–12] Research pertaining to physician performance suggests that personality assessments warrant greater emphasis in the evaluation and training of healthcare professionals.[11,13] Moore et al. evaluated common attributes that were important to achieving excellence and success in residency education that included proficiency in patient management within a specialty practice area, demonstration of professionalism and ethical values, and patient advocacy.[14] Conversely, a Delphi study identified five 'absolutely essential' traits of residents that were valuable in determining the success of a resident by residency directors. The traits included being open to feedback, reflective, teachable, accountable, and being a critical thinker.[2] These findings are similar to other studies of healthcare practitioners that identified personality traits that support the development of excellence in clinical practice.[11,12,15]

A combination of medical knowledge, procedural and technical skills, and personality traits contributes to the performance of physicians-in-training and physicians-in-practice.[13,16,17] While there is substantial evidence assessing medical residents, there is a gap in the literature regarding physical therapy residents. Previous research has assessed the influence of residency education on clinical practice and nonpatient care skills, such as leadership abilities and professional development, but there is limited research on the impact of noncognitive factors on resident performance on a live patient examination, clinical productivity, or patient satisfaction.[18–21]

The purpose of this study is to investigate the association of physical therapy residents' behavior-based personality traits on resident outcomes in three domains: performance on a live patient examination, clinical productivity, and patient satisfaction during the first 3 months of residency training. Understanding the personality traits of residents may help residency programs in the selection of candidates who may have a higher chance of succeeding in these demanding training programs.

Methods

Study design
This study was a prospective observational cohort study. This study is described according to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) statement (https://www.strobe-statement.org/).

Setting
This study included 29 orthopedic physical therapy residents who worked in one of the 15 outpatient orthopedic clinics in the metro-Atlanta area. Each outpatient orthopedic clinic is owned by a parent corporation that has an accredited physical therapy residency program. Participants in this study were recruited via an email invitation with a link to TalentQuest's 16 Personality Factors Questionnaire (16 PF) and an explanation of the questionnaire's purpose and goals. TalentQuest was utilized for all new hires, including residents. Results of personality trait survey were used to assist in recruiting and hiring decisions. Administrative leadership chose to use the TalentQuest survey as a metric to assess potential correlations between new employees' clinical performance and residents' clinical performance. New residents who applied to the physical therapy residency program took the TalentQuest survey again 3 months after matriculation. Each resident completed a standardized 16PF questionnaire via email on their hire date ranging from July 2018 and then again in November 2018. At 3 months, all residents were expected to reach full clinical productivity of 60 treatment sessions per week. All data from each questionnaire were de-identified and assigned an individual ID number.

Participants
Inclusion criteria for this study included the following: (1) the individual was employed by the parent corporation; (2) the individual was enrolled as a current resident; and (3) each resident provided consent for participation in this study. The participants in this study were not required to complete the orthopedic residency as a condition of employment; however, employment was required to participate in the residency program.

Twenty-nine orthopedic residents (17 male and 12 female, mean age 26.37, SD = 1.81) consented to complete the survey. Of the 29 residents, 83% (n = 24) graduated from a doctor of physical therapy program less than 12 months prior to starting the residency program. Of these residents, 79% (n = 19) were new graduates, 13% (n = 3) had 1 year of clinical experience, 4% (n = 1) had 2 years of experience, and 4% (n = 1) had 8 years of clinical experience prior to matriculation into the orthopedic residency program. All residents worked in outpatient clinics in the southeast region of the United States.

Study size
The sample size estimation was performed using G*Power 3.1. The results of a post hoc power analysis revealed that a sample size of 25 individuals was needed for the study to achieve 80% power with an alpha level equal to 0.05.

The alpha level for significance was set at $p < 0.05$ for the first level of analysis.

Data sources/measurement

Live patient examination

The Live Patient Examination is a 10-item, competency-based rubric used by the residency program's mentor to evaluate each resident's performance during an initial physical therapy examination on a patient with musculoskeletal pain. The residency faculty was trained and administered all of the live patient examinations. The live patient exam grading rubric consists of six sections that include the following criteria: conduct a thorough patient history, develop an appropriate list of competing differential diagnoses, identify red flags if present, demonstrate an appropriate physical therapy examination, identify a physical therapy diagnosis and prognosis, and provide an appropriate treatment intervention with provisional patient education relating to the physical therapy diagnosis. Each resident was evaluated on their level of professionalism during the patient encounter and appropriate insurance coding of the interventions provided during the patient encounter. The final scores from the 10 sections of the residents' live patient examination were calculated into a total raw score, which was converted to a percentage. A resident can pass each section if they have met the criterion within each section and required fewer than two verbal cues from the examiner. The final scores from the 10 sections of the live patient examination were categorized as an ordinal variable established as 'pass' for scores >80% and 'not passing' for scores <80%.

Clinical productivity

This study evaluated markers of residency performance for clinical productivity. Productivity was defined as the calculation and report of the average number of treatment sessions completed per day for the month prior to the start of residency (August 2019) and at 3 months following matriculation in the orthopedic physical therapy residency program. Residents were expected to treat 60 patients per week or 12 patients per 8-hour clinic day. Productivity was measured as patients per day. For the statistical analysis, productivity was considered as a dichotomous variable denoted as 0 if the productivity metrics were not met and 1 if they were met.

Patient satisfaction

Data on patient satisfaction were collected using eight questions administered during the patient's discharge survey via Focus on Therapeutic Outcomes (FOTO) outcome measure. Patient response categories were as follows: very satisfied, somewhat satisfied, neither satisfied or dissatisfied, somewhat dissatisfied, or very dissatisfied. The authors acknowledge that reliability and validity of the satisfaction questions have not been established, and other measures of treatment satisfaction may have yielded different results.

Personality trait assessment

TalentQuest 16 PF: The TalentQuest 16 PF was chosen as it was in use throughout the parent corporation to assist with recruiting and hiring decisions. All residents completed the assessment during the interview process. Residents completed the assessment independently online. The 16 PF scores individuals on 16 global measures of personality (Appendix A). The format of the TalentQuest 16 PF is structured with bi-polar personality descriptors listed on either side of a 1–10 Likert scale. For example, social boldness is provided on the left side of the number 1 on the Likert scale and people-oriented is on the right side of the number 10 on the Likert scale. Individuals scoring toward the 1–4 range on the Likert scale identify with stronger personality characteristics of social boldness, while individuals scoring between 7 and 10 identify with characteristics of being people oriented. The assessment provides scores ranging from 1 to 10 for each personality trait. Personality-construct correlations between the TalentQuest 16PF and Cattell's 16 Personality Factor Questionnaire were all statistically significant ($p < 0.05$). Internal consistency estimates for the 16PF range from 0.63 to 0.88 with an average of 0.73. Test–retest reliability estimates have been reported to be approximately 0.80 for a 2-week interval and 0.70 for a 2-month interval.[9] The 16-specific personality factors used by TalentQuest are listed in Appendix A.

Statistical methods

A descriptive analysis was performed to assess the means and standard deviations of the resident's scores on the TalentQuest 16 PF at baseline and 3 months following the start of the residency program. Mann–Whitney U statistical analysis was used to compare the scores of the TalentQuest of the residents at their hire date and 3 months later. Statistical analyses were conducted using IBM SPSS Statistics, version 28.0. The Mann–Whitney U test was used to determine whether there were any differences in personality traits between residents who did and did not meet clinical productivity standards. Spearman's rho correlations were used to assess relationships between residents' personality profiles and clinical productivity levels. Residents with missing data on any of the measured variables at 3 months were considered missing data and were not included in the statistical analysis.

This study was given exempt status by the Institutional Review Board (IRB) at Emory University. Participation in the survey was optional for the participants, and only anonymous data were included.

Results

Participant data

Mean personality characteristic scores at the hire date of the 29 orthopedic physical therapy residents are shown in Table 1. Three months following matriculation in the physical therapy residency program, clinical productivity metrics, patient satisfaction, and live patient examination scores were completed for 19, 23, and 20 residents, respectively.

Results

The residents' personality traits at their hire date demonstrated that the residents rated themselves as being people-oriented, even-keeled, more change-oriented, conscientious, self-confident, and easy-going. Reference ranges for the magnitude of the relationships of the variables are defined as weak correlation 0.0–0.3, moderate correlation 0.3–0.7, and strong correlation as 0.7–1.0.[22] Results of the Spearman's rho correlation indicated there was a positive correlation with residents having passing scores on the live patient examination who self-identified as being people-oriented ($r = 0.531$; $p = 0.02$; $n = 20$), gregarious ($r = 0.464$; $p = 0.04$; $n = 20$), and fearless/social-boldness ($r = 0.521$; $p = 0.02$; $n = 20$). All residents passed the live patient examination; however, a negative correlation was found for those residents who were more self-disclosing ($r = -0.673$; $p = 0.00$; $n = 20$) and self-confident ($r = -0.520$; $p = 0.02$; $n = 20$) with a lower passing score, between 80 and 84%, on their live patient examination. Additionally, there was a positive correlation

Table 1. Means and standard deviations of personality characteristics on the TalentQuest survey of orthopedic physical therapy residents at baseline

Resident's personality characteristics (Scale 1–10)	Mean (SD) of residents at baseline (n = 29)
Unconventional/Conscientious	7.28 (1.97)
Emotional/Even-keeled	6.84 (1.46)
Subdued/Gregarious	6.56 (1.96)
Unorganized/Detail-oriented	6.56 (1.76)
Solitary/People-oriented	6.52 (1.48)
Cautious/Fearless	6.24 (2.03)
Conservative/Change-oriented	5.48 (1.58)
Thinking/Feeling-oriented	5.20 (1.78)
Self-disclosing/Unrevealing	5.12 (2.03)
Pragmatic/Conceptual	5.00 (1.83)
Passive/Controlling	4.84 (1.60)
Self-confident/Unsure	4.76 (1.53)
Team-oriented/Independent	4.04 (1.99)
Accepting/Distrustful	3.88 (1.45)
Easy-going/Restless	3.44 (1.45)

between residents with personality traits of being even-keeled ($r = 0.473$; $p = 0.02$) and meeting clinical productivity goals at 3 months. There was no significant correlation with any of the personality traits and patient satisfaction scores at 3 months. Residents who reported being more even-keeled were associated with meeting productivity goals 3 months following matriculation in the residency program ($U = 37$, $p = 0.02$) (Table 2).

Discussion

The purpose of this study is to investigate whether there is an association of physical therapy residents' behavior-based personality traits and their performance on a live patient examination, clinical productivity metrics, and patient satisfaction scores during the first 3 months of residency training. Residents who were more people-oriented/collaborative, gregarious, and fearless had higher passing scores on the live patient examination. Residents with these personality traits may have received higher live patient examination scores from a mentor's heightened perception of the resident being more adept at meeting the program's goals, maximizing rapport and establishing a positive relationship with a new patient. Our findings of improved live patient examination scores of orthopedic residents with a more gregarious and outgoing personality were similar to findings in a study evaluating the clinical activity of dental students. Dental students who were more people-oriented and gregarious tended to have more effective communication skills during patient interactions.[23] Conversely, residents who were more self-disclosing and self-confident had a lower passing score on the live patient examination. This could indicate that overly self-assured individuals may underestimate the complexity of the patient's presentation, overlook key findings during the clinical examination, or are less likely to follow established clinical guidelines. Additional research is recommended to investigate the impact of residents who are

Table 2. Personality characteristics at hire date and clinical productivity, patient satisfaction, and live patient exam scores of the residents at 3 months

TalentQuest personality characteristics	Correlation coefficient	Significance (P)
Productivity metrics (n = 25) (Scale 1–10)		
Emotional/Even-keeled	0.473	0.017*
Live patient exam scores (n = 20)		
Solitary/People-oriented	0.531	0.02*
Subdued/Gregarious	0.464	0.04*
Cautious/Fearless	0.521	0.02*
Self-disclosing/Unrevealing	-0.673	0.00*
Self-confident/Unsure	-0.520	0.02*

$P \leq 0.05$* statistically significant.

overly self-assured and the effect on clinical performance. Residents who are more self-disclosing might share excessive personal information and distract themselves from fully directing their focus on the needs of the patient, which could be perceived as unprofessional, thus lowering live patient examination scores.

Physical therapy residents who rated themselves as having personality traits of being more even-keeled were moderately correlated with higher clinical productivity during the first 3 months of the program. Personality traits of being even-keeled are associated with increased emotional resilience that include being predictable and stable.[16] Resilience has been identified as a central element of medical student well-being, by giving learners the ability to persist in the learning process in a challenging environment. Furthermore, residents may be influenced by multiple factors to include emotional, behavioral, cognitive, social, and psychological factors.[9,10] Personality factors that contribute to emotional resilience include self-awareness, cognitive flexibility, optimism, and positive thinking.[11] In a study of medical and surgical professionals, individuals who demonstrated higher emotional resilience were classified as high performers during their training in a general surgical residency program and found to have superior clinical performance.[11–13] Similarly, dental students who were more even-keeled, often characterized by emotional stability and adaptability to changing circumstances, were found to meet their clinical productivity goals.[23] This could suggest that residents who remain composed in the face of challenges or stress may be better able to maintain their focus and efficiency in clinical environments.

Despite moderate correlations identified between certain personality traits and clinical performance, no significant associations emerged between personality traits and patient satisfaction scores. This finding suggests that while the residents' personality traits may influence their ability to meet productivity metrics, these traits may not necessarily translate to higher patient satisfaction. Moreover, the questions on the patient satisfaction survey related to the structure of clinical practice did not relate to clinician-level factors. Patients' answers to these questions could be explained by patients' interaction with the healthcare system and may not be influenced by personality traits of the residents. Results of the patient satisfaction scores may be confounded by multiple variables involved in patient–provider interactions in healthcare delivery. These variables may lead patients' answers to reflect more on contextual factors rather than the residents' personality alone (i.e. How satisfied were you with appointment availability of the resident). Further research is needed to explore the complex interplay between clinician characteristics and patient perceptions of overall satisfaction with care.

Beyond the attainment of adequate technical skills, the ability of a provider to leverage certain non-cognitive skills could contribute to their success in clinical care.[15,24] The use of personality assessments may provide some insight into which personality characteristics and behaviors may be worth cultivating in physical therapy residents to best optimize clinical outcomes. The positive correlation between being even-keeled and achieving clinical productivity suggests that emotional stability is a valuable asset in clinical training. As more research emerges, integrating personality assessment into residency training may enhance both resident development and patient care outcomes.

Limitations and generalizability

Due to the small sample size, a limitation of this study is low power in the analysis of the association of residents' personality characteristics. To better assess the relationships among the variables and ensure a more reliable conclusion, future studies with larger sample sizes are needed. Additionally, the methodology of this study did not include the influence of mentoring or didactic residency education; therefore, the authors cannot rule out the possible confounding influence of these factors on the variables of interest. Residents' employment within a parent organization may reflect a biased estimate of the population parameter. The TalentQuest 16PF is used in business to assist with recruiting and hiring considerations based on personality factors; however, it does not have established validity. While the live patient examinations do have an objective score, there is subjectivity in the scoring, which may influence the outcomes. Inter-rater reliability was not established in the live patient examination, so examiner bias could have influenced the grading scale, despite standardized examiner training. The lack of content validity of the live patient examination may have influenced the outcomes despite the standardized didactic training in the residency program. Additionally, the findings from this study lack external generalization to other healthcare professions. More time in the residency program may be necessary to determine longer term clinical performance of residents in training. This study observed only the first 3 months of a 12-month residency program. Essential components of residency program, including didactic education, additional clinical experiences, and professional development opportunities, may yield different results upon completion of the residency program. The questions on the patients' satisfaction survey do not address clinician level performance indicators, which is another weakness of this study.

Future studies could explore residents' personalities on defined domains of patient satisfaction scores directed at the clinical performance of the resident. Additionally, further investigation is needed on the utilization of

personality questionnaires during the interview process and association with residents' performance across a 12-month residency placement.

Conclusion

The personality traits identified by the 16PF identify personality traits that may align with improved performance in a residency program. Based on potential performance, the personality traits identified by 16PF may help residency programs choose between candidates who rank equally in interviews, letters of recommendation, personal statements, and essays. More research is needed, particularly in the realms of assessment and evaluation, to find a reliable, valid, and predictable assessment that can help residency programs decide which candidates are most likely to perform well in their programs.

Ethical approval

The IRB/Ethical Board has given an exempt status for this study.

Conflict of interests

The authors declare that they have no conflicts of interest.

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Appendix A

Comparing 16F personalities with TalentQuest-specific personality factors

	TalentQuest-specific personality factors (Column A compares to Column B)			
	Column A		Column B	
16PF Personalities	*Category*	*Descriptor*	*Category*	*Descriptor*
Social Boldness	Solitary	Shy, hesitant	People-oriented	Connective, comforting
Sensitivity	Lower general ability	Lower scholastic aptitude	Higher general ability	Higher scholastic aptitude
Emotional Stability	Emotional	Uneven, varying mood	Even keeled	Predictable, resilient
Dominance	Passive	Submissive, conciliatory	Controlling	Opinionated, in charge
Liveliness	Subdued	Reserved, solemn	Gregarious	Enthusiastic, exuberant
Rule consciousness	Unconventional	Ignores rules, resists authority	Conscientious	Follows rules, respects authority
Vigilance	Cautious	Quiet, socially uncomfortable	Fearless	Friendly. Talkative, outgoing
Reasoning	Thinking-oriented	Logical, solution-focused	Feeling-oriented	Empathic, intuitive, artistic
Warmth	Accepting	Positive view of others	Distrustful	Negative view of others
Abstractedness	Pragmatic	Bottom-line, fact-oriented	Conceptual	Theoretical, internal focus
Privateness	Self-disclosing	Open, easy to read	Unrevealing	Hard to get to know
Apprehension	Self-confident	Self-secure, comfortable	Unsure	Prone to worry, insecure
Openness to change	Conservative	Prefers established patterns	Change-oriented	Open to new ideas
Self-Reliance	Team-oriented	Enjoys being part of a group	Independent	Prefers to work alone
Perfectionism	Unorganized	Procrastinates, cuts corners	Detail-oriented	Planful, exacting, precise
Tension	Easy-going	Forgiving, tolerant of others	Restless	Easily irritated, quick to judge