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The importance of USMLE step 2 on the screening and selection of applicants for general surgery residency positions

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ABSTRACT

Background: As announced by the Federation of State Medical Boards (FSMB) and National Board of Medical Examiners (NBME), the United States Medical Licensing Examination (USMLE) Step 1 score reporting has transitioned to pass/fail outcomes instead of the traditional numeric score after January 26, 2022. USMLE Step 1 scores have been used widely as a crucial tool in screening and selecting applicants for residency programs. This study aims to determine the role of USMLE Step 2 in the selection of applicants for general surgery residency.

Methods: A retrospective study was conducted over six recruiting cycles from 2016 to 2021. The data from 334 interviewed applicants from one general surgery residency program were assessed. Data analyzed included USMLE Step 1 and Step 2 scores, applicant gender, Alpha Omega Alpha (AOA) status, letters of recommendation (LOR), and research/publications (RS).

Results: Of the 334 interviewed applicants, 209 (62.6%) were male. The mean [SD] USMLE Step 1 and USMLE Step 2 C K (Clinical Knowledge) scores were 239.6 [±10.4] and 249.2 [±11.4], respectively. The mean (SD) LOR and RS scores were 4.24 [±0.4] and 3.9 [±0.7], respectively. A positive correlation was observed between USMLE Step 1 and USMLE Step 2 C K (Clinical Knowledge) scores ($r = 0.60$, $p < .001$), LOR scores ($r = 0.24$, $p = .008$), and AOA status ($r = 0.19$, $p = .038$). There was a negligible correlation between USMLE scores and applicant gender.

Conclusion: Transitioning USMLE Step 1 to pass/fail will make the initial screening and selection process of applications challenging for residency programs. In the short term, USMLE Step 2 scores, LOR, and AOA status are important as screening assessments. Valid measures to ensure appropriate, equitable, and fair assessments are needed.

1. Introduction

The United States Medical Licensing Examination (USMLE®) is a three-step examination program for medical licensure in the United States sponsored by the National Board of Medical Examiners (NBME) and the Federation of State Medical Boards (FSMB). All exams must be passed before an individual with a medical degree or international medical graduates with an M.D. degree are eligible for medical licensure in the United States [1]. The USMLE® was first designed in the late 1980s and introduced in the early 1990s to replace the previously administered NBME Certifying Examination program and the FSMB's Federation Licensing Examination (FLEX) program, which were the widely accepted medical licensing examination programs in the medical profession at the time [2]. The

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NBME exam was originally scored on a pass/fail scale, with scores reported to examinees only [1,3]. The pass rate at the time of transition to USMLE was around 80%. The USMLE was based on the NBME exam, but it was split into 3 sections with the intent to assess for appropriate knowledge base and suitability for progression to supervised and independent practice in a stepwise fashion.

USMLE Step 1 scoring officially transitioned to pass/fail as of January 26, 2022. One study hypothesized that the reasons for transitioning include the inability to significantly modify study plans using available review materials prior to the exam date [4]. Although meant to mitigate the stress on medical students when faced with residency applications, many concerns were raised about the ability to assess candidate suitability for residency using objective measures [2]. The USMLE Step 1 score was previously ranked by Program Directors (PDs) across multiple surgical specialties as the most important screening tool when selecting candidates for residency [4]. On the 2021 National Resident Matching Program PD survey, USMLE Step 1 was identified as the number one most important academic candidate factor in deciding whom to offer interviews and whom to rank [5]. Concerns were raised during the transition period about the inability to identify deficits in medical knowledge [5–7]. Additionally, multiple studies, including a recent systematic review, have demonstrated a positive correlation between higher USMLE Step 1 and 2 scores and passing the American Board of Surgery Qualifying and Certifying Examinations (ABS-QE and ABS-CE) [8–12]. AOA membership and top third undergraduate medical education (UME) class ranking were also associated with a greater probability of first attempt pass rate for the ABS-CE [12]. Research participation during residency was associated with higher first-time pass rates on both ABS-QE and ABS-CE [11]. Performance on mock oral examinations (MOEs) has been positively correlated to ABS-CE first-time pass rates [13]. Gender does not appear to affect ABS-CE pass rates [14]. Therefore, it is important to consider the results of these studies when evaluating candidates' applications for surgical training.

With the USMLE Step 1 transition to pass/fail, programs are left with the challenge of identifying other reliable metrics to identify qualified candidates. The USMLE Step 2 C K was not previously required prior to submission of residency applications, but several studies have theorized that with the change in Step 1 scoring, applicants to competitive specialties will have Step 2 completed prior to residency application submission [6,15]. A survey of surgical PDs across the country has indicated that the emphasis will shift to Step 2 C K score as the next available objective datapoint in evaluating surgical residency applicants [5,8]. Some programs are now planning to require Step 2 score prior to application submission for the upcoming application cycle [5]. In addition to USMLE Step 1 and Step 2 scores, other metrics have been considered, such as clerkship grades, letters of recommendation (LORs), research experiences (e.g., number of presentations, abstracts, and published studies), summative shelf examination scores, and medical school pedigree [15–17]. Concerns have been raised due to the heterogeneity of clerkship grading between medical schools, as well as the subjectivity of recommendation letters [8]. International medical graduates and students from "low-to mid-tier" schools are at a disadvantage in the absence of this objective measure of clinical knowledge [6,8]. With potential challenges in the 2022 application cycle, this paper seeks to identify potential alternative assessment tools to aid in residency candidate selection.

2. METHODS

2.1. Study design and participants

Applications of interviewed candidates for first postgraduate year (PGY1) positions to our academic general surgery residency program from six recruiting cycles (2016–2021) were assessed. We receive between 700 and 800 applications annually through the Electronic Residency Application Service® (ERAS®) for five PGY1 positions. The number of applications that meets our initial screening process ranges between 120 and 200. Selected screened applications undergo a very thorough review by the Program Director and faculty in the following elements: Common Application Form (CAF), medical school transcript, Dean's Letter, USMLE Score Reports, personal statement, research activity, rotation grades, AOA status, and letters of recommendation. Once the review process is completed, invitations are sent to approximately 50–80 candidates. No element in the ERAS® applications was solely used as a single criterion for selecting or inviting an applicant for interview. The interview process was previously conducted as a face-to-face interview. However, in 2020 and 2021, this was modified due to the COVID-19 pandemic, and virtual interviews were conducted instead.

Given the new changes in USMLE Step 1 reporting, we retrospectively evaluated the data of candidates interviewed by our program. This study included 334 applicants from six recruiting cycles at a single institution. Data of the following five objective variables, as reported in ERAS® applications without weighting, were analyzed and included: USMLE Step 1 scores, USMLE Step 2 C K scores, applicant gender, AOA status, and research activity/publications (RS). One subjective factor was the letter of recommendation (LOR). AOA status was assigned as 1 or 0, with 1 indicating AOA induction. Research/Scholarly activity listed in ERAS® applications include eight categories; Non-Peer-Reviewed Online Publication, Oral Presentation, Peer-Reviewed Book Chapter, Peer-Reviewed Journal Articles/Abstracts, Peer-Reviewed Journal Articles/Abstracts (Other than Pub), Peer-Reviewed Online Publication, Poster Presentation, and Scientific Monograph. We counted the total numbers of scholarly activity for all categories and coded the total count 1 to 5 (1 = none to one count, 2 = one to two counts, 3 = three counts, 4 = four counts, and 5 = five counts or more). There were applicants with no scholarly activity at all. LORs were assigned a score of 1–5 based on perceived letter quality. LORs were reviewed and scored by the interview committee (7–9 members), which included the department chair, program director, surgical faculty members, and senior surgery residents. LORs of each applicant were scored by each interviewer/reviewer, and the final LOR score for each applicant was averaged (by dividing the sum of scores by the number of committee members of the day) to help minimize bias. Correlational analyses between USMLE Step 2, and USMLE Step 1, applicants LOR scores, AOA status, research/scholarly activity, and gender were performed. The study protocol was approved by our organization's institutional review board (IRB number WMed-2022-0923). Because this was a retrospective study, written informed consent was not required.

2.2. Statistical analysis

A database with no personally identifiable information was created. Categorical variables were presented as frequencies and percentages and analyzed using the chi squared or exact Fisher test. Continuous variables were analyzed using a *t*-test for independent samples and reported as means and standard deviation (SD). Spearman's rank order correlation was used to determine the relationship between the USMLE Step 1 and USMLE Step 2 C K scores, LOR, AOA, and RS scores. Statistical analysis was performed using SPSS 26 statistical software package (IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp, 2019). A statistical significance was considered for a $P < .05$.

3. RESULTS

A total of 334 applications of interviewed candidates from six recruiting cycles (2016–2021) were analyzed. There were 125 (37.4%) female applicants (Table 1). The mean (SD) USMLE Step 1 and USMLE Step 2 scores were 239.44 (10.55) and 249 (11.50), respectively. The mean (SD) USMLE Step 1 score was higher for male applicants compared to female (240.41 [10.65] vs. 237 [10.10]), and this was statistically significant ($p = .029$). Reciprocally, female applicants had higher USMLE Step 2 scores, although not statistically different from male applicants (250 [11.1] vs. 248 [11.5], $p = .208$]. Fig. 1 demonstrates the distribution of USMLE Step 1 and USMLE Step 2 scores among male and female applicants. AOA status was reported in 127/334 (38%) applicants. Twenty (15.7%) applicants received AOA, with a higher proportion of females than male (20.4% vs. 12.8%). However, this was not a statistically significant difference ($p = .253$). The overall mean (SD) LOR score was 4.24 (0.41). Notably, LORs were rated significantly higher for female candidates [4.33 (0.37) vs. 4.19 (0.42), with $p = .002$]. Research and scholarly productivity of applicants in decreasing order of frequency included: poster presentations (n = 242, 72.45%), peer-reviewed abstracts and oral presentations (n = 159, 47.6%), peer-reviewed journals/online publications (n = 23, 6.9%), and book chapters (n = 12, 3.6%). There was no significant difference in the mean score of research activity/publications between male and female applicants ($p = .859$).

We found a moderate positive correlation between USMLE Step 1 and USMLE Step 2 C K scores ($r = 0.60$, [95% CI; 0.47, 0.68], $p < .001$), but a weak correlation between USMLE Step 1 and LOR score ($r = 0.24$, 95% CI [0.06, 0.40], $p = .008$), and a very weak correlation between USMLE Step 1 and AOA status ($r = 0.19$, 95% CI [0.02, 0.34], $p = .038$). Both research and gender had a negligible correlation with the USMLE Step 1 score. Fig. 2 depicts a scatter plot demonstrating the relationship between USMLE Step 1 scores and the predictors evaluated in this study (i.e., USMLE Step 2, LOR, AOA, and Research).

Table 1
Difference by gender.

Factor	Gender		p-value
	Female (n = 125)	Male (n = 209)	
USMLE Step 1, Mean (SD)	237.8 (10.20)	240.4 (10.65)	.029
USMLE Step 2, Mean (SD)	250.1 (11.40)	248.4 (11.51)	.208
Letter of Recommendation (LOR)	4.3 (0.37)	4.2 (0.42)	.002
Research/Publications	4.14 (0.79)	4.13 (0.76)	.841
Alpha Omega Alpha (N = 127)			.253
- Yes, n (%)	10 (20.4)	10 (12.8)	
- No, n (%)	39 (79.6)	68 (87.2)	

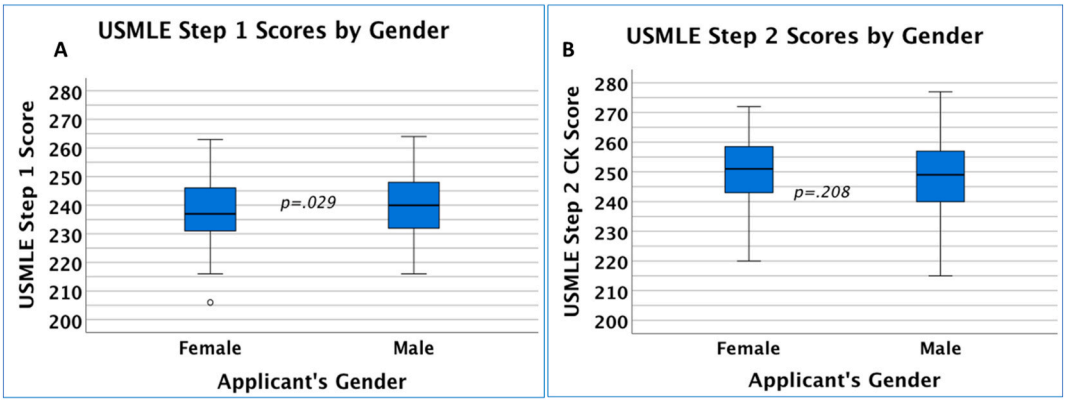
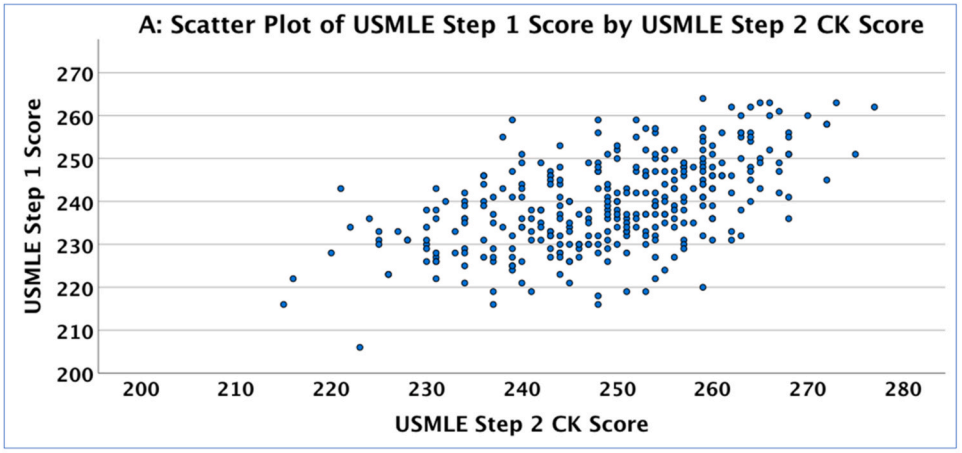
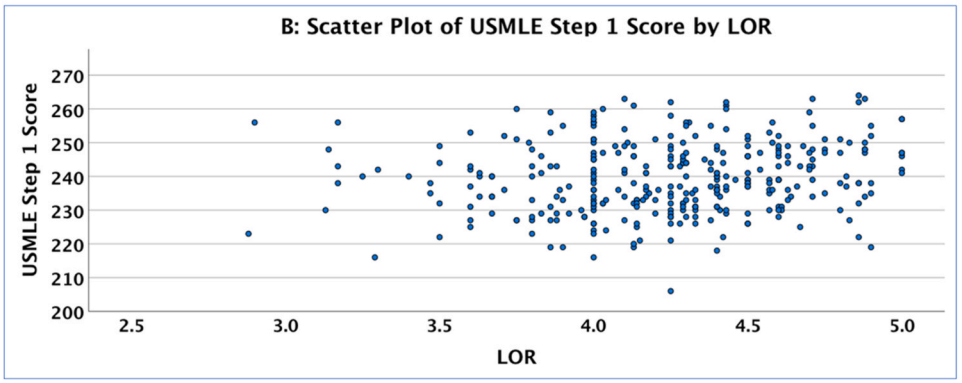
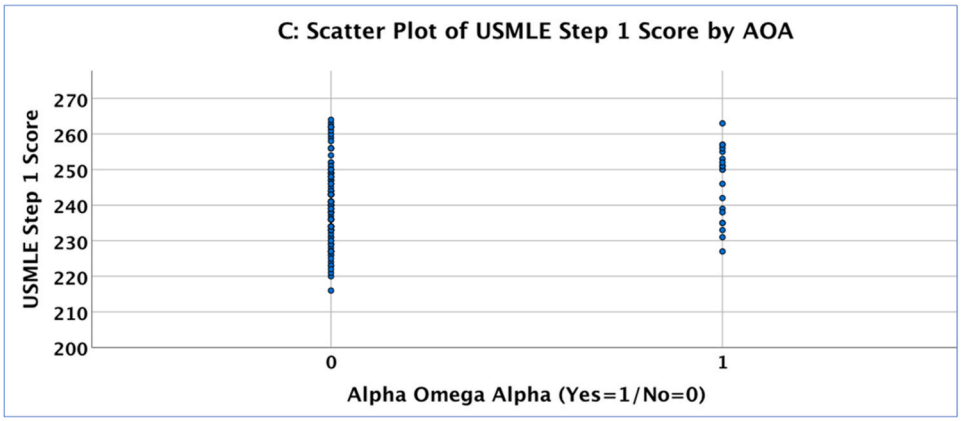


Fig. 1. Tukey's Box plot showing the distribution of USMLE Step 1 (Fig. 1 A) and USMLE Step 2 (Fig. 1 B) among male and female applicants.







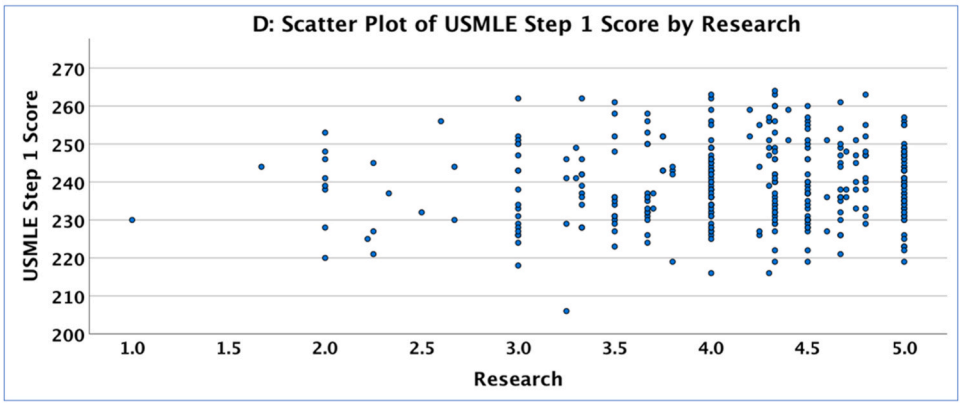


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Fig. 2. Scatter Plot demonstrating relationship between USMLE. Step 1 and other predictors (USMLE Step 2, LOR, AOA, and Research). Fig. 2A: Scatter Plot demonstrating relationship between USMLE Step 1 and USMLE Step 2 scores. Fig. 2B: Scatter Plot demonstrating relationship between USMLE Step 1 and LOR. Fig. 2C: Scatter Plot demonstrating relationship between USMLE Step 1 and AOA. Fig. 2D: Scatter Plot demonstrating relationship between USMLE Step 1 and Research.

4. Discussion

We found that the USMLE Step 2 C K score strongly correlates to the USMLE Step 1 score, followed by LOR scores and AOA status. Applicant gender and research activity have a negligible correlation to USMLE Step 1 score. USMLE Step 2 C K score, reported as a three-digit score, was originally designed to test clinical knowledge; however, as the purpose of both USMLE Step 1 and Step 2 become more focused on clinical skills rather than foundational basic science, the USMLE Step 2 score is an important adjunct numerical objective assessment that can be used in the screening process of selecting candidates for residency. To write a letter of recommendation on behalf of a student, the writer (chair, faculty) will likely use their knowledge about the students, in addition to objective data such as board scores or AOA status. At many schools, election to AOA is determined in part by board examination performance [18]. The emphasis of USMLE Step 2, LOR, and AOA status found in our study does not preclude the diligent task of program leadership in performing a holistic review of the entire candidate application. This is important as relying on numbers alone does not provide an equitable and fair evaluation. Some applicants excel in less-tangible areas which require robust evaluation.

The reporting method of the NBME (i.e., scores vs. pass/fail) has been controversial and debatable over the last eight decades. In the 1930s, the NBME originally chose to report examination results as numeric scores rather than a pass/fail designation due to the belief that this feedback benefited students [19]. Although the NBME used to report the scores to students only, in the 1970s, residency programs started requesting that applicants submit their scores, and these scores became a factor in selecting and ranking candidates [20]. An increasing number of residency programs and the large numbers of applicants since the 1980s has led to many challenges for PDs faced with selecting competitive residents from an expanding pool of applicants. Despite warnings by the NBME against the use of its exams for residency selection, the fierce competition of the Match led to a reliance by PDs on objective scores, in addition to other materials such as LOR, Dean's letter, chair letters, AOA election, interviews, and grades [21]. With increasing utilization of numerical scores during the selection process, the programs became more interested in studying the relationship between student performance on these exams and passing board exams.

The recent decision to transition USMLE Step 1 to pass/fail is unsurprisingly controversial, with students, residents, and program directors expressing concerns of inability to objectively assess student suitability for progression to residency [8,22,23]. A survey of residency PDs across all specialties showed that 94% of them rated USMLE Step 1 as the most important factor in determining competitiveness for a specialty [22]. Program directors have already begun to search for alternatives. The USMLE Step 2 C K score has been shown to correlate with residency performance on in-service exams [24]. One study examining resident competitiveness for surgery residency found that without considering USMLE Step 1 or Step 2, the number of research experiences, AOA status, and graduation from a top 40 NIH-funded medical school will all become critical factors in considering applicants for surgical residencies [16]. This could potentially disadvantage a vast group of otherwise qualified individuals, such as US MD applicants from programs without NIH funding, Doctor of Osteopathic Medicine (DO) applicants, and international medical graduates (IMGs), as there will no longer be an objective, numerical metric with which to compare them [6,8]. Other factors such as the Medical Student Performance Evaluation (MSPE) letter could be considered, but a previous study demonstrated the great variability in grading schemes and reporting among medical schools, making this a far less reliable indicator of candidate suitability [25].

In our study, data showed the importance of USMLE Step 2 C K, LOR, and AOA, while showing the negligible association between gender and USMLE Step scores. In a landscape of general surgery residencies where the number of female applicants continues to increase year by year, this reaffirms that gender should not be considered when evaluating applicant suitability for surgery residency.

This study has several limitations. First, this is a retrospective study, with all inherit limitations of that kind of study. Second, this is a study of a single institution with a small sample size, therefore, the difference between male and female applicants may reflect a small sample size, and this should be interpreted with caution. Third, this study does not take into consideration the applicants' other academic performance and achievements such as clerkship grades or rotation evaluations. This is due to the exceedingly high degree of variability between medical schools in clerkship grading and constructing rotation evaluations. There is no standardized evaluation form or grading template. Additionally, AOA status is only eligible to US MD graduates, and therefore, this may undervalue DO candidates and IMGs. A fourth limitation is that we did not evaluate the impact of applicant's volunteer activity, Golden Humanism award status, and diversity factors (e.g., ethnicity, race). A fifth limitation is the quality of LOR assessment, which is inherently subjective and may vary from institution to institution and reviewer to reviewer. Another limitation is that, due to program size, and duration of this study, we did not evaluate the effect of these predictors on prospective resident's likelihood of success (as defined by completion of residency in 5 years, fellowship, practice, or academic track) at our program.

We anticipate that with the elimination of numerical USMLE Step 1 scores, more standardized methods of evaluating medical students will be developed in the coming years. In the meantime, to deliver an in-depth and fair assessment by which they may distinguish their candidates, programs must now undergo an even more exhaustive and meticulous review of their applications to uncover some of the more elusive characteristics and achievements not measured in numerical scores. While the results of this study can provide an assessment tool in the short term, it is imperative that other standardized grading rubrics be developed to aid programs in the arduous resident selection process.

5. Conclusions

With the transition of USMLE Step 1 to pass/fail, identifying reliable, objective measures of applicant suitability in the coming cycle poses a challenge to residency programs across the country. Until other objective, verified measures have been introduced, we have found that USMLE Step 2 scores, LOR, and AOA status are important factors in screening and selection for the application cycle. Comprehensive assessment of candidate applications remains the foundation of a fair selection process for positions in residency training.

Author contribution statement

Saad Shebrain, Robert Sawyer and Sarah Khalil: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Lisa Miller, Gitonga Munene, Alain Elian, Jennifer Timmons, and Joslyn Jose: Performed the experiments; Wrote the paper.

Matthew Welter: Contributed reagents, materials, analysis tools or data; Wrote the paper.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data is not publicly available due to the privacy of research participants.

Additional information

No additional information is available for this paper.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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