



Demographic and clinical factors associated with intraoperative patient cooperation during LASIK

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ABSTRACT

Background: Poor patient cooperation during ophthalmic surgery is demonstrated to result in a variety of complications. The purpose of this study is to evaluate demographic and clinical factors associated with intraoperative patient cooperation during laser in situ keratomileusis (LASIK) surgery.

Methods: This retrospective observational study included patients who underwent LASIK at a single institution. Patients were graded intraoperatively by three observers using a 5-point scale for cooperation during flap creation, fixation during excimer laser ablation, and head/body movement, with lower scores indicating better cooperation. Ordinal regression models were used to evaluate associations between cooperation scores and demographic characteristics or medical history.

Results: A total of 836 patients were included, with a mean age of 35 years (SD, 10.3; range, 18–80 years), 454 (54.3%) male and 382 (45.7%) female; 70% of patients achieved the best overall cooperation score. Patients were significantly less cooperative during flap creation than during head/body movement ($P < 0.05$). Older age was associated with improved cooperation during flap creation (odds ratio [OR], 0.98; 95% confidence interval [CI], 0.96 to 1.00; $P < 0.05$), laser fixation (OR, 0.97; 95% CI, 0.96 to 0.99; $P < 0.05$), and movement (OR, 0.97; 95% CI, 0.96 to 0.99; $P < 0.05$). Female patients displayed significantly better cooperation only during flap creation (OR, 0.71; 95% CI, 0.53 to 0.96; $P < 0.05$). Longer laser duration was associated with worse cooperation during laser fixation (OR, 1.15; 95% CI, 1.05 to 1.26; $P < 0.05$) and movement (OR, 1.13; 95% CI, 1.02 to 1.23; $P < 0.05$). No significant associations were observed between overall cooperation and medical history diagnoses (all $P > 0.05$); however, anxiety showed an imprecise association with poorer cooperation (OR, 2.20; 95% CI, 0.97 to 5.00).

Conclusions: Patient cooperation during LASIK was generally excellent, although cooperation was worst during flap creation. Older age was modestly associated with improved cooperation across all three categories, female sex was associated only with flap-creation cooperation, and longer excimer laser duration was associated with laser fixation and movement, while no statistically significant associations with the assessed medical-history or medication variables were detected. Prospective studies in LASIK and other refractive procedures are warranted to validate and further elucidate the preliminary findings of this study.

KEYWORDS

anxiety, behavior, sex, cooperation, demographic factors, LASIK, refractive surgical procedures, corneal flaps.

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INTRODUCTION

Modern laser vision correction platforms have led to faster treatment times, increasingly precise laser ablation, and software designed to track eye movements, ensuring efficient and consistent procedures. Despite these advances, patient cooperation during refractive surgery remains a key aspect of surgical success. Poor patient cooperation during ophthalmic surgery is demonstrated to result in a variety of complications, including suction loss, decentration, incomplete lenticule dissection, and higher order aberrations [1–3]. If significant, these concerns can lead to suboptimal visual outcomes postoperatively and contribute to a negative patient experience intraoperatively. More broadly, adequate preoperative evaluation, preparation, and patient–provider communication have been emphasized as important components of reducing avoidable surgical cancellations [4]. Ensuring optimal patient cooperation is therefore important to streamlined, safe, and comfortable procedures.

Evaluating demographic and clinical risk factors related to intraoperative patient cooperation may be one strategy to identify gaps in support needs. Previous studies evaluating communication within eye clinics found that ophthalmologists were able to consistently change their clinical approach when identifying patients with a history of depression or anxiety, allowing for a more tailored appointment experience [5]. In patients undergoing cataract surgery, patient cooperation is found to have significant associations with eye laterality, dominance, sex, and age, suggesting that demographic factors may show consistent trends related to intraoperative behavior [6–8]. However, there remains a significant gap in identification of demographic and medical risk factors impacting patient cooperation within laser in situ keratomileusis (LASIK).

The purpose of this study was to evaluate the association of demographic and clinical factors with patient cooperation during LASIK at a single surgical center. Specifically, cooperation was evaluated during flap creation, fixation during excimer laser ablation, and in terms of overall head and body movement. Identifying patients at higher risk for reduced cooperation may help physicians anticipate intraoperative challenges, improve preoperative counseling, and implement strategies to enhance patient comfort.

METHODS

This retrospective observational study evaluated patient cooperation during routine LASIK. All patients who underwent LASIK surgery between March 2024 to October 2025 at one refractive surgery center in Draper, Utah, were consecutively included in the study. This study adhered to the tenets of the Declaration of Helsinki and was approved by the Biomedical Research Alliance of New York (BRANY) Institutional Review Board (IRB), which approves retrospective research use related to corneal and refractive procedures data at Hoopes Vision. Written informed consent was obtained from all included patients. Patients who did not provide consent for use of research and study data were excluded.

All patients received a comprehensive eye exam preoperatively, including slit lamp examination, dilated fundoscopy, and manifest refraction. Manifest refraction was measured using a phoropter (Ultramatic RX Master™ Phoropter®; Reichert Technologies, Buffalo, NY, USA) with patient-guided subjective measurements of sphere and cylinder. Cylinder notation was minus and spherical equivalent was calculated by calculating sphere + ½ cylinder. Slit-lamp examination (Haag-Streit USA, Mason, OH, USA) included a thorough exam of the eyelids, conjunctiva, cornea, and anterior segment. Tropicamide 1% (Bausch + Lomb, Bridgewater, NJ, USA) was used for pupillary dilation. Dilated fundus examination, including assessment of the optic nerve and retina, was performed using an indirect ophthalmoscope with a condensing lens (Vantage Plus LED Wireless Indirect Ophthalmoscope; Keeler Ltd., Windsor, Berkshire, UK). All patients underwent assessments of uncorrected and best-corrected visual acuity using the Smart System (M&S Technologies, Niles, IL, USA) at 6 m, with visual acuity recorded in Snellen notation; intraocular pressure was measured using a Tono-Pen (Reichert, Buffalo, NY, USA); and corneal topography was assessed using a Pentacam (Oculus, Wetzlar, Germany).

Intraoperative cooperation data were collected prospectively as part of routine clinical care while the research question and retrospective analysis were initiated in 2026. Patient-reported demographic data was collected, including age at time of surgery, sex, prior medical history, medications, and use of alcohol or tobacco. Medical history and medication use was self-reported. Medications were further categorized into chronic medication use or current use of prescription medications for one year or longer, and psychotropic medication use, defined as current use of medication that affects psychological function by acting on the central nervous system. Psychotropic medication classes included antidepressants, antipsychotics, anxiolytics, psychostimulants, and mood stabilizers.

Surgery was performed using standard protocols for LASIK. For flap creation in LASIK, the VisuMax 500 laser (Carl Zeiss Meditec AG, Jena, Germany), Alcon FS200 femtosecond laser (Alcon Surgical, Fort Worth, TX, USA), or iFS Advanced Femtosecond Laser (Johnson & Johnson Surgical Vision, Milpitas, CA, USA) was utilized. The Alcon EX500 excimer laser (Alcon Surgical, Fort Worth, TX, USA) device was utilized for subsequent excimer laser ablation. All patients were offered 5 mg oral diazepam preoperatively and received this dose one hour prior to the procedure. Diazepam was offered uniformly to all patients. Patients who declined diazepam (1.4%) did not receive it. No other sedatives or analgesics were administered. Intraoperative information including surgery performed, femtosecond laser used for flap creation, and excimer laser ablation time was recorded.

Each patient was graded intraoperatively using a predefined grading scale to provide a quantitative value for each qualitative behavior. Patients were graded in three categories: cooperation during flap creation, eye fixation during excimer laser ablation, and movement of the body or head during the entire surgery.

For each category, a score of 1 through 5 was assigned, where 1 indicated an optimal level of cooperation and 5 indicated very poor cooperation (Table 1). The grading framework was adapted from Zarei-Ghanavati et al. [9], with the score direction reversed so that 1 indicated the best cooperation and 5 indicated the worst cooperation, and with the behavioral anchors modified for three LASIK-specific domains: flap creation, laser fixation, and head/body movement. Suction loss or laser interruption was assigned a poor-cooperation score only when judged attributable to patient behavior. All patients were graded by three observers who were involved in the patient's intraoperative care, consisting of the surgeon, laser technologist, and surgical nurse, who came to a consensus of a single score for grading immediately following the surgery. The same operating team assessed every patient.

Optimal cooperation for flap creation in LASIK was defined as the ability to place the appplanation glass appropriately on the patient's cornea with proper centration and successful femtosecond completion of flap creation. Behaviors that reduced laser fixation scores included requiring the laser to be paused and restarted or needing repeated reminders to look at the light for excimer laser ablation. Movement behaviors impacting cooperation scores consisted of crossing the legs, tilting the head up or down, and fidgeting. An overall cooperation score, or the sum of scores during flap creation, laser fixation, and movement, was also calculated for analysis, where a score of 3 indicated an optimal level of cooperation across all 3 categories and a score of 15 was the poorest cooperation score.

Statistical analysis was performed using SPSS Statistics, version 32.0 (IBM Corp., Armonk, NY, USA). Continuous variables were summarized as mean (standard deviation [SD]) and range, while categorical variables were summarized as frequency and percentage. All continuous variables were assessed for normality using the Shapiro-Wilk test. Separate multivariable ordinal logistic regression models were used to evaluate associations of age, sex, sphere, cylinder, and excimer laser ablation duration with cooperation scores for each of the three cooperation categories. Proportional-odds ordinal logistic regression models with a logit link were used, with odds ratios (ORs), 95% confidence intervals (CIs), and *P*-values reported as measures of association and statistical significance, respectively. Cooperation scores across the three categories, flap creation, laser fixation, and head and body movement, were compared using the Friedman test with Bonferroni correction for multiple comparisons. In addition, associations between the overall cooperation score and medical history diagnoses, chronic medication use (metformin and losartan), and psychotropic medication use (sertraline, amphetamine-dextroamphetamine, and bupropion) were assessed using a separate ordinal logistic regression model. These analyses were considered exploratory and were intended to evaluate associations rather than establish causal relationships between demographic or clinical factors and intraoperative cooperation. A two-sided *P*-value < 0.05 was considered statistically significant.

Table 1. Patient behavior grading scale

Category	Best Cooperation ← → Worst Cooperation				
Cooperation During Flap Creation	1: Ideal cooperation	2: Requiring 1–2 reminders	3: Requiring >2 reminders	4: Requiring change in eye position by joy stick	5: Suction loss, stopping and restarting laser, or requiring manual repositioning
Laser Fixation	1: Ideal cooperation	2: Requiring 1–2 reminders	3: Requiring >2 reminders	4: Requiring change in eye position by joy stick	5: Stopping and restarting the laser or requiring manual repositioning
Head and Body Movement	1: Ideal cooperation	2: Requiring 1–2 reminders	3: Requiring >2 reminders	4: Requiring help with restriction of movement	5: Requiring manual repositioning

RESULTS

A total of 836 patients were evaluated. Mean (SD, range) age at surgery was 35 (10.3; 18 to 80) years (Table 2); 454 (54.3%) patients were male and 382 (45.7%) female. Mean (SD, range) sphere, cylinder, and spherical equivalent were -2.51 (2.02; -8.75 to 6.00) D, -1.02 (1.04; -8.00 to 1.00) D, and -3.02 (1.93; -9.125 to 3.375) D, respectively. Mean (SD, range) laser duration was 9.14 (4.04; 1 to 22) seconds. Intraoperative diazepam was administered to 98.6% of patients. Of the 785 patients with documented laser type, 675 (86.0%) underwent treatment using the VisuMax 500, 64 (8.2%) using the FS200, and 46 (5.9%) using the iFS laser. Laser type was not documented for 51 (6.1%) patients. All other medical history variables were complete for all 836 patients (Table 2).

The most common medical history diagnoses were migraine (82 [9.8%] patients), asthma (42 [5.0%]), hypertension (41 [4.9%]), anxiety (39 [4.7%]), and depression (28 [3.3%]). Thirty-six patients (4.3%) reported a history of tobacco use and 208 (24.9%) reported a history of alcohol use; 401 patients (48.0%) reported chronic medication use, and 162 (19.4%) reported use of psychotropic medications.

A majority of patients achieved an ideal score of 1 in each cooperation domain: flap creation, laser fixation, and head/body movement (Figure 1). Overall, 587 patients (70.2%) received an overall cooperation score of 3, indicating a score of 1 in all three domains. The sex composition by cooperation score is shown in Figure 2. The mean scores for flap creation, laser fixation, and head/body movement at each overall cooperation score are shown in Figure 3.

The Friedman test showed a statistically significant difference in cooperation across the three domains ($\chi^2(2) = 40.869$, $P < 0.001$, $n = 836$). Mean ranks were 2.06 for flap creation, 2.02 for laser fixation, and 1.92 for head/body movement, with lower mean ranks indicating better cooperation. Post hoc pairwise comparisons with Bonferroni adjustment showed significantly better cooperation for head/body movement than for flap creation (adjusted $P = 0.011$). No statistically significant differences were detected between flap creation and laser fixation (adjusted $P > 0.99$) or between laser fixation and head/body movement (adjusted $P = 0.09$).

Ordinal logistic regression showed that increasing age was significantly associated with better cooperation across all three domains (Table 3). Each additional year of age was associated with lower odds of a worse cooperation score for flap creation (OR, 0.98; 95% CI, 0.96 to 1.00; $P = 0.01$), laser fixation (OR, 0.97; 95% CI, 0.96 to 0.99; $P = 0.002$), and head/body movement (OR, 0.97; 95% CI, 0.96 to 0.99; $P = 0.01$). Compared with males, females had lower odds of a worse cooperation score during flap creation (OR, 0.71; 95% CI, 0.53 to 0.96; $P = 0.03$), although the associations for laser fixation (OR, 0.76; 95% CI, 0.55 to 1.04; $P = 0.08$) and head/body movement (OR, 0.72; 95% CI, 0.51 to 1.02; $P = 0.06$) were not statistically significant. No statistically significant associations were detected for sphere or cylinder in any domain. Each additional second of recorded excimer laser ablation duration was associated with higher odds of a worse cooperation score for laser fixation (OR, 1.15; 95% CI, 1.05 to 1.26; $P = 0.002$) and head/body movement (OR, 1.13; 95% CI, 1.02 to 1.23; $P = 0.02$), but not flap creation (OR, 1.08; 95% CI, 0.99 to 1.17; $P = 0.07$). The direction of these relationships cannot be determined from the retrospective data.

Table 2. Demographic characteristics of study participants

Parameter	Value (n = 836 patients)
Age (y), Mean $\pm$ SD (Range)	35 $\pm$ 10.3 (18 to 80)
Sex (Male / Female), n (%)	454 (54.3)/382 (45.7)
Sphere (D), Mean $\pm$ SD (Range)	-2.51 $\pm$ 2.02 (-8.75 to 6.00)
Cylinder (D), Mean $\pm$ SD (Range)	-1.02 $\pm$ 1.04 (-8.00 to 1.00)
Spherical Equivalent (D), Mean $\pm$ SD (Range)	-3.02 $\pm$ 1.93 (-9.125 to 3.375)
Hypertension, n (%)	41 (4.9)
Migraines, n (%)	82 (9.8)
Asthma, n (%)	42 (5)
Anxiety, n (%)	39 (4.7)
Depression, n (%)	28 (3.3)
Tobacco Use, n (%)	36 (4.3)
Alcohol Use, n (%)	208 (24.9)
Chronic Medication Use, n (%)	401 (48)
Psychotropic Medication Use, n (%)	162 (19.4)
Excimer laser ablation duration (s), Mean $\pm$ SD (Range)	9.14 $\pm$ 4.04 (1 to 22)

Abbreviations: n, number of participants; y, years; SD, standard deviation; %, percentage; D, diopter; s, seconds. Note: All represented values are based on patient-level data.

Table 3. Ordinal regression model analysis of patient demographics for each cooperation category

Variable	Flap Creation			Laser Fixation			Movement		
	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value
Age (per 1 year)	0.98	0.96 – 1.00	0.01	0.97	0.96 – 0.99	0.002	0.97	0.96 – 0.99	0.01
Female vs. Male	0.71	0.53 – 0.96	0.03	0.76	0.55 – 1.04	0.08	0.72	0.51 – 1.02	0.06
Sphere (per 1 D)	1.11	0.94 – 1.30	0.23	1.07	0.90 – 1.27	0.40	1.14	0.94 – 1.38	0.17
Cylinder (per 1 D)	1.08	0.82 – 1.43	0.57	1.11	0.83 – 1.48	0.50	1.28	0.92 – 1.77	0.14
Excimer laser ablation duration (per 1 s)	1.08	0.99 – 1.17	0.07	1.15	1.05 – 1.26	0.002	1.13	1.02 – 1.23	0.02

Abbreviations: OR, odds ratio; CI, confidence interval; D, diopter; s, seconds. Note: *P*-values < 0.05 are shown in bold; male sex was used as the reference category for sex comparisons.

Table 4. Mutually adjusted ordinal regression model analysis of medical history factors associated with overall behavior score

Variable	OR	95% CI	P-value
Hypertension	0.68	0.32 – 1.49	0.35
Migraines	0.70	0.41 – 1.19	0.19
Asthma	1.73	0.93 – 3.22	0.08
Anxiety	2.20	0.97 – 5.00	0.06
Depression	0.84	0.31 – 2.27	0.46
Tobacco Use	0.54	0.23 – 1.23	0.14
Alcohol Use	1.20	0.84 – 1.70	0.33
Chronic Medication Use	0.78	0.55 – 1.11	0.17
Psychotropic Medication Use	0.84	0.52 – 1.34	0.46

Abbreviations: OR, odds ratio; CI, confidence interval.

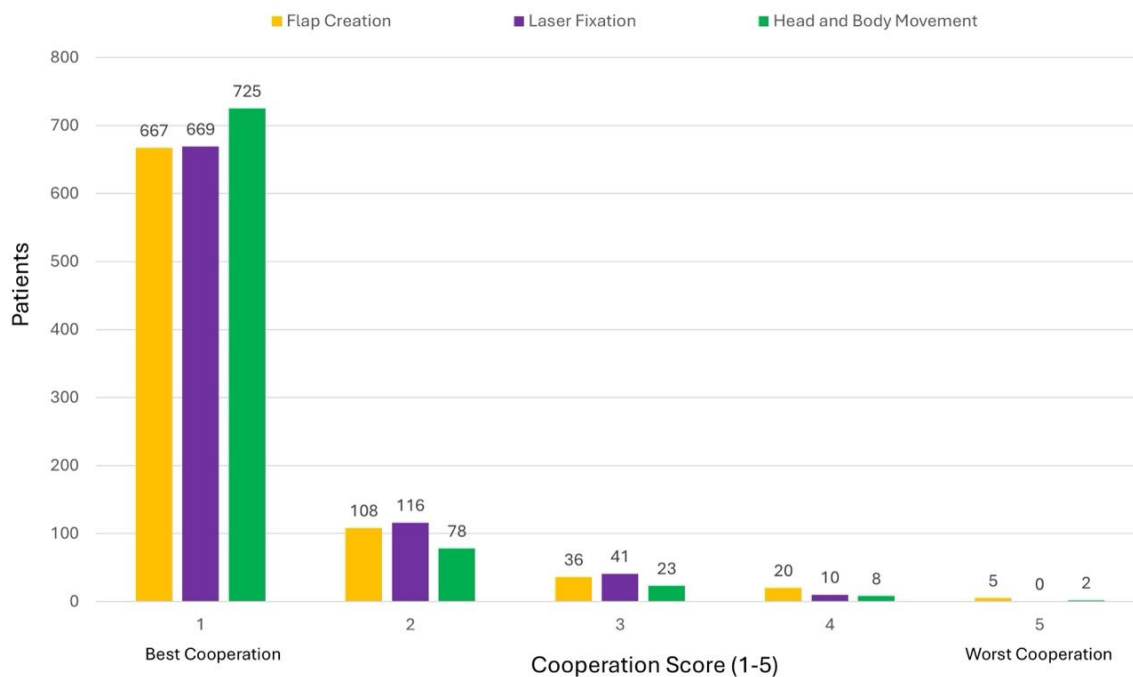


Figure 1. Observed distribution of cooperation scores across the three intraoperative cooperation domains. Each of the 836 patients received one score for flap creation, one for laser fixation, and one for head/body movement, resulting in 2508 domain-specific ratings. Within each domain, the frequencies across scores 1–5 sum to 836 patients. A score of 1 indicates the best cooperation, a score of 5 the worst cooperation.

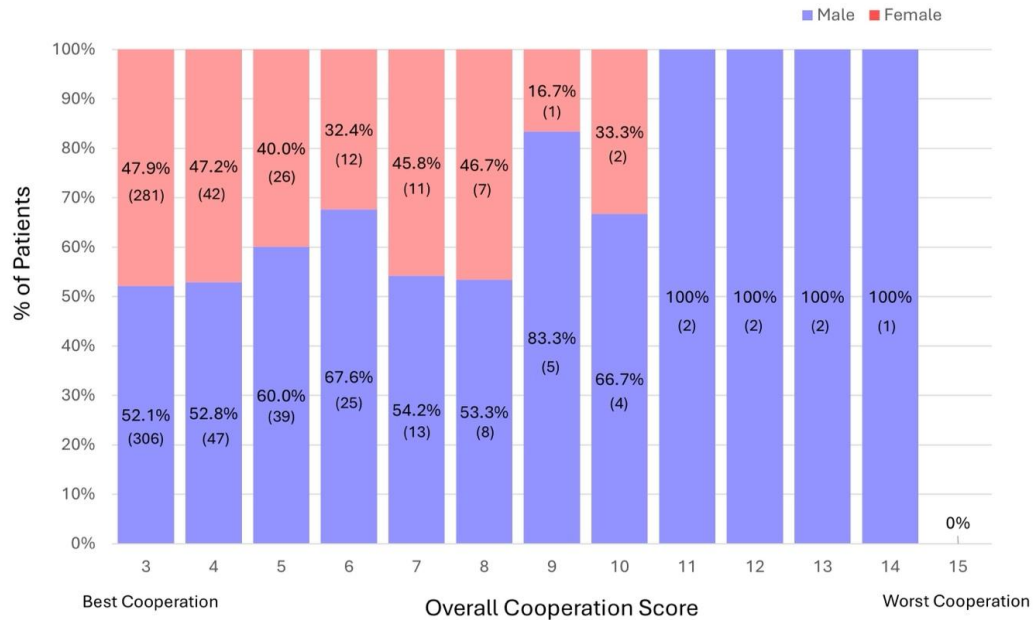


Figure 2. Sex composition at each overall cooperation score (n = 836). The stacked bars show the percentages of male and female patients within each observed overall cooperation score, with corresponding patient counts in parentheses. Percentages are calculated using the total number of patients at each score as the denominator. The overall cooperation score is the sum of the three domain scores; higher scores indicate poorer cooperation. No patient had an overall score of 15.

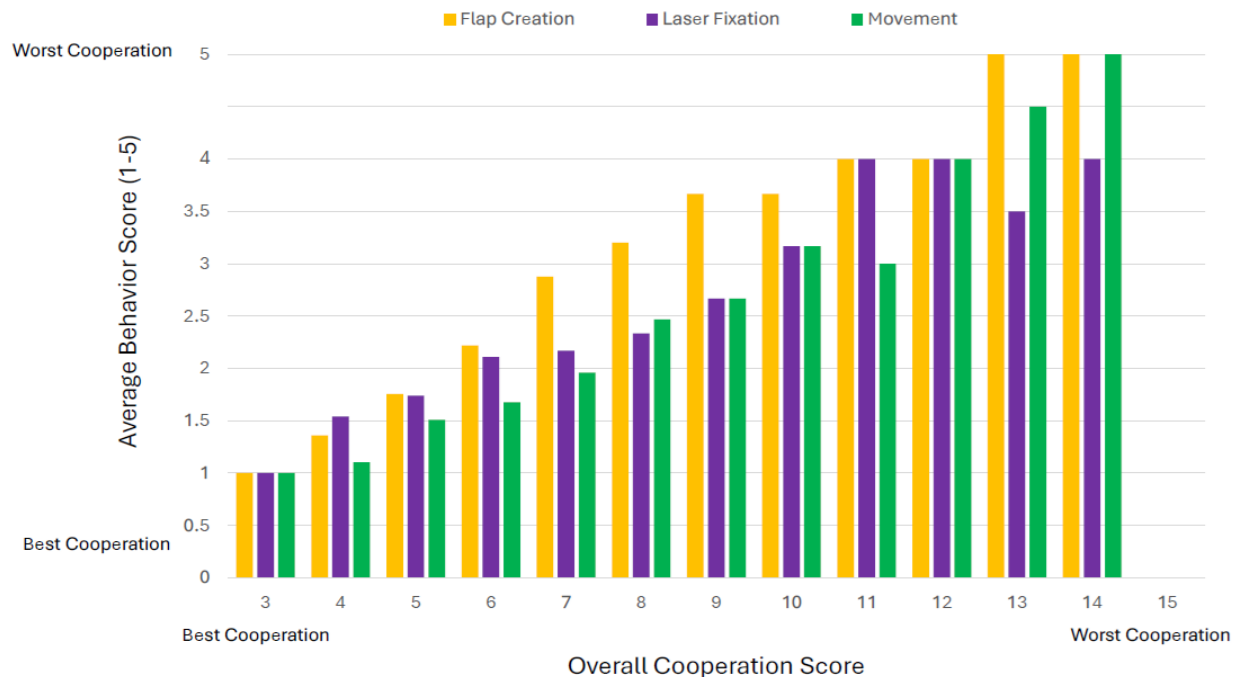


Figure 3. Category-specific mean cooperation scores by overall cooperation score in LASIK patients (n = 836). Bars show the mean scores for flap creation, laser fixation, and movement among patients at each overall cooperation score. The overall cooperation score is the sum of these three component scores, therefore the figure provides a descriptive decomposition of the overall score. Higher scores indicate poorer cooperation.

In the mutually adjusted ordinal logistic regression model, no statistically significant associations were detected between the overall cooperation score and a history of hypertension, migraines, asthma, anxiety, depression, tobacco use, or alcohol use, or reported chronic or psychotropic medication use (all $P > 0.05$) (Table 4). No multiplicity correction was applied to the exploratory ordinal regression analyses, therefore the reported P-values are nominal and should be interpreted cautiously.

DISCUSSION

This study evaluated the impact of patient demographic factors on intraoperative cooperation during LASIK. Lack of patient cooperation can impact patient intraoperative experience and lead to an increased rate of complications, making optimizing cooperative behaviors critical. Overall, a majority of patients (70.2%) received a compiled score of 3, indicating that most LASIK patients show optimal cooperation intraoperatively across flap creation, laser fixation, and movement. The remaining patients, however, displayed a potential gap in cooperation that warrants additional investigation.

Our findings show that patients appear to have the most difficulty with cooperation during flap creation, suggesting that additional physician support and guidance should be provided at this portion of the procedure. Flap creation is the stage where patients typically experience the greatest pressure on the eye, which can be accompanied by transient dimming, loss of vision, or frightening visual phenomena [10, 11]. These unfamiliar sensations may increase anxiety and contribute to poorer cooperation. To account for difficulties during this portion of the procedure, surgeons could consider preoperatively explaining visual phenomena that patients may expect to see, where and how to gaze, intraoperative sensations, and the importance of not moving the head and body during the procedure [12, 13]. Additionally, longer excimer laser duration was associated with less cooperation during laser fixation, perhaps representing a cyclical process where laser ablation takes more time in patients with difficulty cooperating. To identify patients who may require additional comfort and guidance, surgeons should also be aware that higher preoperative anxiety has been associated with greater fixation instability and poorer surgeon-rated cooperation during LASIK [14]. Stress balls, padding under the head, manual massage, encouraging meditation, or playing music in the background may also be tools to improve patient comfort [13–15].

Though associations between age or sex and cooperation were statistically significant, the clinical importance of these associations is uncertain because no clinically meaningful effect threshold was prespecified. Therefore, these findings reflect potential trends rather than clinically significant predictions of cooperation. Older age was associated with better cooperation across all three domains, whereas female sex was associated with better cooperation only during flap creation. Limited knowledge about illness is found to be associated with greater surgical fear, anxiety, and lower satisfaction, suggesting that comprehension of treatments and procedures is empowering to patients [16]. Literature has observed that older patients are more likely to receive additional information preoperatively and direction from surgical teams intraoperatively than younger patients [17]. This trend is also evidenced in studies evaluating patient behaviors based on sex. Female patients were found more likely to ask questions during healthcare appointments, attend health screenings more regularly, and be a more active participant with healthcare professionals [18]. When considering both age and sex differences, availability of information preoperatively and comfort during the procedure may have contributed to the discrepancies noted in our cohort; however, these suggested explanations remain speculative in LASIK populations until further validated.

In terms of medical history, no statistically significant associations were detected with cooperation, though the estimate for anxiety was imprecise and compatible with both little association and substantially higher odds of poorer cooperation (OR, 2.20; 95% CI, 0.97 to 5.00). A previous study evaluating PRK patients similarly found that history of anxiety or depression was not associated with overall patient cooperation [1]. In contrast, a study of patients undergoing LASIK found that higher preoperative anxiety was associated with greater fixation instability and poorer surgeon-rated cooperation [14]. The reason for our contrasting findings may be that nearly all patients (98.6%) in our cohort received oral diazepam preoperatively, perhaps masking behaviors that may have been present without the use of anxiolytics. Future studies evaluating the impact of medical diagnoses on patient cooperation without such confounding factors would allow for better characterization of these associations.

Limitations of this study include the use of a quantitative grading scale to estimate qualitative behavior. Although the adapted grading scale was not independently validated, we designed our grading scale based on a study by Zarei-Ghanavati et al. evaluating cooperation during PRK [9]. A single observer used to assess all outcomes could have

introduced individual observer bias, therefore three observers were used. However, even this approach introduces some degree of interobserver heterogeneity and reliability was not measured. Ultimately, we found that the use of three consistent graders who came to a collective consensus allowed for standardized grading across all patients. The graders were not blinded to age, sex, or other relevant demographic factors, so subjective biases could have contributed to cooperation classification. The use of an examiner blinded to patient demographic factors by only assessing a video of the eye during surgery was considered, yet this would have prevented the ability to evaluate head and body movements of the patient—behaviors that could have only been evaluated by being present in the operative room. In terms of statistical analysis, associations between demographic factors and cooperation scores are based on correlation analyses rather than causation. Therefore, conclusions should be viewed as exploratory and as identifying associations rather than as establishing definitive causation. Other unevaluated factors, such as eye dominance and laterality, could also contribute to perceived differences in cooperation. Eye-order effects could not be evaluated, as a single patient/session-level cooperation score was assigned. Notably, diazepam was given to 98.6% of patients preoperatively, which could be a confounding variable potentially improving cooperation ability. As this study was based at one surgery center in Draper, UT (USA), findings may not be generalizable to other populations. Additionally, demographic data from patients was self-reported, including past medical history and medication use, so we may be underestimating the extent of patients with health conditions if they chose not to disclose this information. The observed associations related to age and sex reflect exploratory findings rather than inherent behavioral differences between populations. Our study did not collect information on postoperative visual outcomes, therefore we were unable to assess whether patient cooperation levels were associated with differences in visual outcomes. Future prospective, multicenter studies should validate the adapted LASIK cooperation scale through independent observer ratings, assess inter-rater reliability, and evaluate its generalizability across diverse patient populations. Eye-specific, time-resolved assessments incorporating preoperative anxiety and sedative exposure should clarify the temporal relationship between cooperation and laser duration and establish whether cooperation scores are associated with clinically meaningful intraoperative complications or postoperative visual outcomes.

CONCLUSIONS

Patient cooperation during LASIK was excellent, with the worst patient cooperation displayed during flap creation. Older or female patients showed a tendency to cooperate more than younger or male patients. Longer laser duration was associated with poorer cooperation during laser fixation; however, the direction of this relationship cannot be determined from the retrospective data. Additional preoperative counseling and intraoperative guidance may represent a potential strategy to improve intraoperative cooperation during LASIK.

ETHICAL DECLARATIONS

Ethical approval: This study adhered to the tenets of the Declaration of Helsinki and was approved by the Biomedical Research Alliance of New York (BRANY) Institutional Review Board (IRB) which approves retrospective research use related to corneal and refractive procedures data at Hoopes Vision. Written informed consent was obtained from all included patients. Patients who did not provide consent for use of research and study data were excluded.

Conflict of interest: None.

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