INSIGHTS-IJHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

ORIGINAL RESEARCH

Volume 4 | Issue 2 | 2026
ISSN: 3007-2948

ASSESSING PATIENT COMFORT, ANXIETY, AND SATISFACTION DURING CYCLOPLEGIC REFRACTION: COMPARING CONVENTIONAL DROPS WITH RAPID-ONSET CYCLOPLEGICS

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CONFLICT OF INTEREST
None declared.

GRANT SUPPORT
None declared.

ARTICLE TYPE
Original Research

ABSTRACT

Purpose
To assess the comfort, anxiety, and satisfaction between conventional cycloplegics (e.g., cyclopentolate) and rapid-onset cycloplegics (e.g., tropicamide with phenylephrine) drops during cycloplegic refraction.

Methods
This randomized controlled trial was conducted at Al Shifa Trust Eye Hospital, Sukkur, enrolling participants aged 10–20 years selected through simple random sampling. Eligible participants were healthy participants within ±1D refractive error, while those with systemic or ocular pathology were excluded. All underwent cycloplegic refraction assessment and a structured questionnaire on anxiety, discomfort, communication, and overall experience during cycloplegic refraction, using a Likert scale and a Visual Analogue Scale for comfort.

Results
A total of 83 participants were enrolled, with a mean age of 15.54 ± 2.97 years; 49.4% were females and 50.6% males. The Visual Analogue Scale showed higher comfort ratings overall, with 25.3% reporting "Very Comfortable." Comparison between Cyclopentolate and Tropicamide with phenylephrine groups using the Mann–Whitney U test revealed significant differences in anxiety ($p=0.029$), relaxation during waiting ($p<0.001$), concern over duration of effects ($p<0.001$), immediate discomfort after instillation ($p=0.001$), light sensitivity ($p<0.001$), progressive discomfort ($p=0.004$), perceived procedure less uncomfortable ($p<0.001$), and overall comfort ($p<0.001$).

Conclusion
The study concluded that Tropicamide with phenylephrine was associated with greater overall comfort, satisfaction, and tolerance compared to Cyclopentolate, which showed higher levels of anxiety, discomfort, and light sensitivity. No significant differences were observed between the groups regarding reassurance, clarity of explanation, and provider communication during cycloplegic refraction.

Registration No: NCT06914063

KEYWORDS Tropicamide, Cyclopentolate, Satisfaction, Refraction.

INSIGHTS-IJHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

ORIGINAL RESEARCH

Volume 4 | Issue 2 | 2026
ISSN: 3007-2948

INTRODUCTION

Cycloplegics work by inhibiting accommodation through the pharmacological paralysis of the ciliary muscles, leading to relaxation of the eye and thinning of the lens, which helps in focusing on distant objects. These drugs block the muscarinic effect of acetylcholine on ciliary muscle receptors, preventing the stimulation of both the ciliary muscles and the iris sphincter. As a result, cycloplegics are classified as antimuscarinics, anticholinergics, or parasympatholytic agents. The effectiveness of such drugs has been proven in several studies and within the most frequent cyclo leafic medications, tropicamide, cyclopontolate, homatropine as well as aropine are typical [1].

For accommodation the ciliary body moves forwards and the Zonular fibres are lengthened. These fibres are attached to the vitreous body and lens posterior capsule and cause a change in the lens shape. The curvature and thickness of the lens are altered due to the contraction of the ciliary body, which decreases the radius of the anterior and posterior lens. The changes in the posterior surface are smaller, the lens becomes thicker and the depth of the anterior chamber decreases. Pupil diameter decreases as the eye accommodates and converges as a part of the near triad. As a consequence, as the eye accommodates and the pupil aperture decreases, the wa vefront area available to be measured is reduced, so the optical quality information obtained with a wavefront aberrometer is limited [2].

Among pediatric populations, cycloplegic refraction is the gold standard for estimating refractive error [3]. Cycloplegia is considered essential when assessing refractive errors in children to ensure accommodation is relaxed, helping to identify refractive error. Clinical guidelines from various optometry associations recommend performing retinoscopy after pharmacologically inducing cycloplegia during the first eye examination for children, typically up to eighteen years of age. The American Optometric Association also advocates for cycloplegic retinoscopy as the preferred method for school-age children up to twenty years during their first evaluation [4].

Cycloplegic agents work by inhibiting the action of acetylcholine at muscarinic receptors in the ciliary muscle and iris, resulting in cycloplegia and mydriasis, respectively. The different agents differ in their onset of action, time to effective cycloplegia, and duration of action. Effective cycloplegia is affected by iris color, with lighter-colored irides dilating and achieving cycloplegia faster than darkercolored irides [5].

The agents that are used most often for cycloplegia are atropine, cyclopentolate, and tropicamide. Clinical use of cyclopento late and tropicamide agents are more frequent, although atropine is the gold standard for cycloplegia. However, the effects of atropine start later and last longer round about two weeks, and side effects are frequent. Tropicamide, a synthetic analog of tropic acid is commonly preferred over other agents due to its quicker onset and fewer side effects. However, some systemic side effects, including eye sinking sensations, corneal irritation, tachycardia, dry mucous membranes, and flushing, may still occur. Tropicamide is preferred more often because its effects start earlier and it has fewer side effects than other agents [6].

Cycloplegic agents temporarily paralyze the ciliary muscle, leading to the loss of accommodation, while mydriatic drugs target the iris sphincter to induce mydriasis. Both types are parasympatholytic but differ in onset, duration, and effectiveness. Common agents include atropine, homatropine, scopolamine, cyclopentolate, and tropicamide. Atropine is a potent agent with a long onset (6–24 hours) and duration (10–15 days), but it can interfere with daily activities and cause side effects like rapid pulse, dry mouth, and allergic reactions. Cyclopentlate that acts faster - 30-45 min as well as having a shorter duration - 6-24 hours, is a good alternative. Tropicamide with the quickest onset of action (20 minutes) and shortest duration of action (4-6 hours) is often favoured for its action in relieving ciliary spasm in anterior uveitis and preventing or breaking posterior synechia. It works also in refraction in the accommodation syntactic mail for the weak accommodation statistics [7].

Cyclopentolate is synthetic antimuscarinic cyclic which are available in a 0.5% and 1% solution is the drug of choice for the short term duration of cycloplegia in any age group. Ocular side effects of it may be an irritation, lacrimation, allergic blepharoconjunctivitis, conjunctival hyperemia, and elevated intraocular pressure. Systemic side effects include drowsiness, ataxia, disorientation, incoherent speech, restlessness and visual hallucination. Tropic acid alternatives are another synthetic analog of tropic acid called tropicamide which is a safe alternative for cycloplegic refraction which is known to have rapid onset of effect and short recovery time. Its ocular side effects are stinging with corneal irritation, increase in intraocular pressure and systemic side effects can be dry mucous membranes, flushing, and tachycardia [8].

Cycloplegic refraction is a process for the estimated, the point "effective estimate" of the true refractive error is inhibition of accommodation. For fine correction of refractive errors, use of cycloplegia is required, especially in young children and patients with full accommodative esotropia or high levels of hyperopia which will require greater accommodative efforts. Early research suggested that cycloplegic effect of tropicamide is not as strong as atropine or cyclopentolate making it inadequate cycloplegic refraction in children. However recently some studies suggested that possibly cyclopentolate as well tropicamide may be equally effective regarding refractive measurements. There is a greater need of cycloplegic agent in hyperopic children due to higher accommodative efforts. While there is no clear consensus on the best agent, a new mixed eye drop solution containing 0.5% tropicamide and 0.5% phenylephrine offers a more convenient and hygienic option for clinical use [9].

Tropicamide, a non-selective muscarinic antagonist, suppresses the parasympathetic drive, relaxing both the iris sphincter (mydriasis) and ciliary muscles (cycloplegia). The medication is generally safe, but reported side effects include increased IOP, irritation, dry mucus membranes, flushing and tachycardia. Rarely, tropicamide may cause central nervous system disturbances and psychotic reactions in paediatric patients. Tropicamide is available at doses of 0.5% and 1%. A common dilation regimen in adults is 1.0% tropicamide used in combination with 2.5% phenylephrine [10].

Combination cycloplegic and/or mydriatic drops are not commercially available. The only obtainable medications are 1% tropicamide, 1% cyclopentolate, 0.5% and 1% atropine, and 10% phenylephrine. The absence of combined medication formulations

INSIGHTS-IJHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION
ORIGINAL RESEARCH
Volume 4 | Issue 2 | 2026
ISSN: 3007-2948

at lower concentrations increases the risk of adverse effects. In addition, no standardized national guideline has been established for pediatric cycloplegia [11].

The primary causes of ocular morbidity in children are refractive errors and strabismus, and effective refractive correction is essential for achieving ideal vision and binocularity. Cycloplegic refraction is an essential part of the pediatric ophthalmic assessment [12].

Cycloplegic retinoscopy is the reference standard for measuring refractive errors in the pediatric age group, as objective refractive errors can be obtained by completely relaxing accommodation using this method [13]. Retinoscopy is conducted in a dimly lit environment. The patient is situated 1 m from the examiner. The retinoscope light is shone into the patient's eye, and the patient is instructed to gaze at it. Depending on the distance and mirror used, significant conclusions can be drawn from the retinoscopic reflex movement. Based on the red reflex movement for the 1 m setting of the plane mirror , no movement implies a 1 D myopia ; a movement in the retinoscope's direction suggests emmetropia, hypermetropia, or myopia of less than 1 D ; and a movement opposite the retinoscope's direction indicates myopia greater than 1 D. Tropicamide is the most commonly used mydriatic drug because of its low side effect profile, powerful mydriatic effect, and rapid onset of action. It is available in two concentrations, 0.5% and 1%; 1% produces cycloplegia, and 0.5% produces pupillary dilatation with minor cycloplegia. Owing to less dilatation alone in preterm infants, it can be supplemented with a combination of 2.5% or 5% phenylephrine [14, 15]

METHODOLOGY

This study was designed as a randomized controlled trial (RCT) conducted at Al Shifa Trust Eye Hospital, Sukkur, over a duration of six months following approval from the BASR. The sample size was calculated using an independent t-test with a 95% confidence level, 90% statistical power, an effect size of 0.767, and a precision level of 0.05, based on previously reported mean and standard deviation values. A total of 74 participants (37 per group) were required; however, to compensate for an anticipated 10% drop out rate, the final sample size was increased to 83 participants as determined by G*Power. Simple random sampling was used to recruit male and female participants aged 10–20 years. Eligible participants were required to be healthy, with no anterior or posterior segment abnormalities, and have refractive errors within ±1.00 diopter spherical equivalent. Individuals with a history of adverse reactions to cycloplegic agents, ocular surgery, intraocular or systemic diseases, or psychological conditions affecting response reporting were excluded. Ethical approval was obtained from the Superior University Ethical Committee, and written informed consent was secured prior to enrollment. Participants were randomly allocated into two groups: the intervention group received rapid-onset cycloplegic drops (tropicamide with phenylephrine), while the control group received conventional cycloplegic drops (cyclopentolate). The study followed a triple-blind protocol, in which participants, outcome assessors, and data analysts were blinded to group allocation. Data collection tools included a structured Likert-scale questionnaire assessing anxiety, discomfort, understanding, and overall experience, along with a Visual Analogue Scale for comfort and a demographic proforma. Cycloplegic refraction was performed for all participants, and procedure time, immediate symptoms, and delayed effects were recorded. Data analysis was carried out using SPSS, and the Mann-Whitney U test was applied to compare comfort, anxiety, and satisfaction scores between the two groups, with statistical significance set at $p < 0.05$.

RESULTS

Among the 83 participants, 41(49.4%) were female and 42(50.6%) were male (see Figure No. 1). The mean age of participants was 15.54±2.97 years, with a range of 11 to 20 years.

Responses on the Visual Analogue Scale suggest that the majority of participants reported reasonably positive comfort levels during the procedure. A plurality, which accounted for 25.3% (n=21) of respondents, stated that they were "Very Comfortable." This response was followed by the "Slightly Uncomfortable" rating given by 15 respondents (18.07%), which was closely followed by 13 respondents (15.66%) who reported being "Moderately Comfortable." Furthermore, 10 respondents (12.05%) reported being "Almost Fully Comfortable." Even smaller proportions reported "Moderate Discomfort" (9 respondents, 10.84%) or "Slight Discomfort" (6 respondents, 7.23%). Roughly speaking, the participants who reported "Neutral" (3, 3.61%), "No Comfort" (2, 2.41%), or "Completely Comfortable" (2, 2.41%) were also in the minority refuting the claim that pain was experienced during the procedure. The least chosen category was "Very Little Discomfort" as well as "Mild Discomfort" where each response accounted for 1 participant (1.20%). The comfort ratings as a whole were positive, which suggests that the participants were comfortable enough during the procedure

Table No. 1: Comparison of Responses between Cycloplegics and Tropical with phenylphrine groups

Question	Mean Rank (Cyclo)	Mean Rank (Trop-ph)	Mann-Whitney U	p-value
I felt anxious when the drops were administered.	48.35	37.14	617.5	0.029*
I felt relaxed during the waiting period after the drops were instilled.	29.39	51.66	392.0	<0.001*
I was worried about how long the effects of the drops would last.	53.97	32.83	415.0	<0.001*
I felt reassured by the healthcare provider during the procedure.	38.94	44.34	736.0	0.253
I was concerned about any potential side effects of the drops.	43.64	40.74	787.0	0.575
I experienced discomfort immediately after the drops were instilled	51.5	34.72	504.0	0.001*

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INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION
ORIGINAL RESEARCH
Volume 4 | Issue 2 | 2026
ISSN: 3007-2948

I found the stinging sensation from the drops manageable.	38.06	45.02	704.0	0.159
I experienced light sensitivity during the procedure.	53.03	33.55	449.0	<0.001*
I felt my eyes becoming progressively more uncomfortable as the drops took effect.	50.13	35.78	553.5	0.004*
Blurry vision during the procedure caused me discomfort.	46.11	38.85	698.0	0.154
The purpose of the cycloplegic drops was clearly explained to me.	43.11	41.15	806.0	0.645
I felt I had enough information about what to expect during the procedure.	41.51	42.37	828.5	0.850
The healthcare provider addressed my concerns before the procedure started.	46.18	38.8	695.5	0.122
I was informed about the expected duration of the drops' effects (e.g., blurry vision, light sensitivity).	44.56	40.04	754.0	0.286
I felt confident in the competence of the healthcare provider.	43.93	40.52	776.5	0.454
I felt that my concerns and questions were taken seriously during the procedure.	41.32	42.52	821.5	0.809
The procedure felt less uncomfortable than I expected	31.07	50.37	452.5	<0.001*
Overall, I felt comfortable and reassured during the cycloplegic refraction.	31.0	50.43	450.0	<0.001*

Statistical comparisons were made between Cycloplegic and Tropicamide groups regarding issues of comfort, anxiety, and communication using Mann-Whitney U test. The following responses achieved significance, where $p<0.05$ was found as follows: apprehensive administration of the drops ($p=0.029$), and relaxed waiting ($p<0.001$), worrying about the drops and their effects ($p<0.001$), and reporting discomfort right after instillation ($p=0.001$), experiencing light sensitivity during the procedure ($p<0.001$) and discomfort aggravating during the procedure, reporting that the procedure was somehow less uncomfortable than expected ($p<0.001$), and reporting ease and reassurance in the comfort of the procedure ($p<0.001$). In the cases of the above-mentioned items, where anxiety and discomfort was present, cyclopentolate patients were identified as having the higher mean ranks. In contrast, patients with rapid-onset cycloplegics, during the procedure were associated with greater relaxation, less discomfort, and their expected comfort was greater than anticipated. The remaining ten items, covering reassurance from healthcare providers, clarity of explanation, addressing concerns, confidence in the provider, and information adequacy, showed no statistically significant differences, indicating similar patient experiences between the two groups in these domains.

Table No. 2: Comparison of Responses

Questions	Cyclo (n=36)			Trop with phenylphrine (n=47)		
	Disagree n(%)	Neutral n(%)	Agree n(%)	Disagree n(%)	Neutral n(%)	Agree n(%)
Q1	07(19.44)	13(36.11)	16(44.44)	25(53.19)	08(17.02)	14(29.79)
Q2	10(27.78)	16(44.44)	10(27.78)	02(4.25)	07(14.89)	38(80.85)
Q3	07(19.44)	10(27.78)	19(52.78)	29(61.70)	09(19.15)	09(19.15)
Q4		03(8.33)	33(91.67)		01(2.13)	46(97.87)
Q5	09(25.0)	09(25.0)	18(50.0)	17(36.17)	09(19.15)	21(44.68)
Q6	06(16.67)	11(30.55)	19(52.78)	26(55.32)	07(14.89)	14(29.79)
Q7	09(25.0)	07(19.44)	20(55.55)	02(4.25)	14(29.79)	31(65.96)
Q8	05(13.89)	07(19.44)	24(66.67)	26(55.32)	05(10.64)	16(34.04)
Q9	05(13.89)	06(16.67)	25(69.44)	12(25.23)	14(29.79)	21(44.68)
Q10	05(13.89)	10(27.78)	21(58.33)	12(25.53)	11(23.40)	24(51.06)
Q11			36(100)	01(2.13)		46(97.87)
Q12	03(8.33)	01(2.78)	32(88.89)			47(100)
Q13		05(13.89)	31(86.11)		01(2.13)	46(97.87)
Q14	01(2.78)	01(2.78)	34(94.44)	01(2.13)	01(2.13)	45(95.74)
Q15	01(2.78)	05(13.89)	30(83.33)		08(17.02)	39(82.98)
Q16	01(2.78)	06(16.67)	29(80.55)		10(21.28)	37(78.72)
Q17	20(55.55)	04(11.11)	12(33.33)	03(6.38)	10(21.28)	34(72.34)
Q18	15(41.67)	08(22.22)	13(36.11)	06(12.76)	01(2.13)	40(85.11)

Comprehending patterns within the responses made to the 18 presented questions using the 5-point Likert scale showcased some notable differences between Cyclopentolate and Tropicamide groups. "I was worried about how long the effects of the drops would last" was a statement that produced similar patterns, with just over half expressing concern within the Cyclopentolate group (52.8%) and with a predominant amount of respondents within the Tropicamide group not expressing concern (61.7%) Most respondents on "I felt reassured by the healthcare provider during the procedure" overwhelmingly agreed to this statement (Cyclopentolate 91.7%, Trop 97.9%). The statement "I was concerned about any potential side effects of the drops" and "I experienced discomfort

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INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION
ORIGINAL RESEARCH
Volume 4 | Issue 2 | 2026
ISSN: 3007-2948

immediately after the drops were instilled" produced higher agreement levels within the Cyclopentolate group (50% and 52.8%) when compared to Tropicamide (44.7% and 29.8%) where higher proportions of disagreement were observed. The statement "I found the stinging sensation from the drops manageable" showed leaning agreement within Cyclopentolate (55.6%) and much stronger agreement within Tropicamide (66%). In "I experienced light sensitivity during the procedure", Cyclopentolate showed agreement within two-thirds (66.7%) of respondents, while the Tropicamide group showed a higher rate of disagreement (55.3%). The statements. In the discomfort related statements, Cyclopentolate group showed stronger agreement on, "I felt my eyes becoming progressively more uncomfortable as the drops took effect" (69.4% vs.
44.7%), "Blurry vision during the procedure caused me discomfort" (58.3% vs. 51.1%). More than 90% of the items when the cycle group relayed information and communicated surround the explanation of the drops and their duration, effects, etc. were supported. Cyclo group scores ranged from 86%-100% and 95%-98% for Trop. Confidence in the competence and responsiveness of both providers (Cyclo >80%, Trop >78%) of both groups were aligned in affirming this.
Responses indicating least comfort expected during the procedure highlight the most distinctive contrast, where Cyclo responses were most ambivalent (55.6% disagreement vs 33.3% agreement), whereas in Trop, the sentiment was predominantly one of agreement (72.3%). The statement "I felt comfortable and reassured during the cycloplegic refraction" overall reflected that Cyclo participants were distributed across all categories, with 41.7% expressing discontent and 36.1% content to the statement, while for Trop, 85.1% registered an emphatic agreement, indicative of overwhelming sentiment.

DISCUSSION

The breakdown of the sample received in this research showed that there was a close to equal gender mix (49.4% females and 50.6% males) and 83 people (mean age 15.54±2.97) were included in the study. The Visual Analogue Scale results showed that there was a general tendency of respondents to rate their comfort higher where the biggest chunk of responses was "Very Comfortable" (25.3%) and only a few groups expressed discomfort and the neutral or no comfort responses were marginal. The Mann–Whitney U test indicated differences between users of Cyclopentolate and Tropicamide in 8 aspects: anxiety during drop instillation, aggravation during the waiting period, concern regarding the effect of the drug, discomfort after the procedure, sensitivity to light, discomfort, relief, and assessment of comfort. Cyclopentolate users had higher mean rankings in anxiety, aggravation, discomfort, and light sensitivity, while Tropicamide respondents reported greater relaxation and lower discomfort, with better overall comfort. There was an absence of contradiction between respondents of Tropicamide and the "relaxed, comfortable" positive expression which was only endorsed by Cyclopentolate users along with other anxiety issues, particularly dominant disagreement with light discomfort, prolonged discomfort, and the dominant agreement with the more negative expressions regarding discomfort and side effects. This was endorsed by 18 Likert items.
While Routinely, the communication, Facilitating, and Professionalism were specifically communication in a more positive manner, with the agreement of 85% on most items in regards to the communication of the provider. However, overall comfort and expectation evoked substantial differences were noted, as 72.3% of the respondents of the Tropicamide reported agreement with the procedure being less uncomfortable than they expected, whereas, in contrast, the Cyclopentolate group went unreassured and met with negative responses on most of the core items expected on comfort which was in 85.1% of the TParticipant responses.
As for the current study, 83 participants were enrolled with an almost equal gender distribution, where females were 49.4% and 50.6% males, with an average age of 15.54 ± 2.97 years and an age range of 11 to 20 years. This was in contrast to the study carried by Pei et al. (2021), who had a much bigger study population of 300 young adults (108 males and 192 females) with an age range of 17 to 22 years and a mean age of 19.03 ± 1.01 years. As a result, their study population was older and more concentrated in late adolescence and early adulthood, while our study population was focused on mid-adolescence. Notably, Pei et al. In contrast reported no significant differences in baseline characteristics such as age, gender, and non-cycloplegic refraction between the cyclopentolate and tropicamide groups, which reinforces the comparability of treatment arms in their trial. In our case analysis, we are able to consider alternative angles due to the distinctive gender balance, as well as the comparatively younger age distribution within the study group. This facilitates an investigation of an age group that has received insufficient attention in the literature pertaining to the complexities of comfort, anxiety, and satisfaction. [16]
Our VAS results show a predominance of positive comfort ratings during cycloplegic refraction, with the largest group reporting "Very Comfortable" (25.3%) and only a small minority reporting the most severe discomfort categories. Recent literature over the last 3–4 years emphasizes strategies to reduce discomfort — for example, using lower concentrations of cyclopentolate, delivering microdrops, or applying a topical anesthetic prior to instillation — because these approaches reduce stinging and related adverse effects that lower patient comfort. [17,18]
Our research noted remarkable distinctions between the cyclopentolate and tropicamide groups concerning the eight reported variables of patient anxiety, discomfort, photophobia, distress, and general comfort. Such findings have also been noted in contemporary research (2022-2025) indicating that, although both agents may be similar in refractive efficacy, tolerability is better with tropicamide. For example, the recent meta-analysis by Bist et al. (2025) found no significant difference in refractive error outcomes between tropicamide 1% and cyclopentolate 1%, but emphasized better patient comfort and shorter duration of side effects with tropicamide. Similarly, studies in young adults with dark irises report that tropicamide leads to less visual disruption and a quicker recovery period. Our results expand on those by showing that, beyond recovery and visually measurable effects, patients perceive less anxiety, less worry about duration of drops, less progressive discomfort and light sensitivity when using tropicamide or rapid-onset cycloplegics. These differences may be clinically relevant in choosing agents, especially in populations sensitive to discomfort (e.g., children, anxious patients). Nevertheless, unlike many studies which report only broad tolerability outcomes, our

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INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION
ORIGINAL RESEARCH
Volume 4 | Issue 2 | 2026
ISSN: 3007-2948

study provides detailed, phase-specific responses (instillation, waiting, etc.), allowing more precise understanding of how and when discomfort arises. [19]

Our findings show that participants given cyclopentolate reported higher agreement with anxiety, worry about duration, immediate stinging/discomfort, progressive discomfort, and light sensitivity, whereas those given tropicamide reported greater relaxation, less discomfort than expected, and much higher overall comfort are consistent with the trend in recent literature favoring tropicamide for tolerability while showing clinically equivalent refractive efficacy in many non-strabismic populations. A recent meta-analysis and systematic reviews from 2024–2025 indicate that tropicamide 1% and cyclopentolate 1% produce similar end-point refractions in children and adults, but tropicamide is frequently recommended when shorter duration of effect, faster recovery, and better patient comfort are priorities. [19]

Randomized trials from the last few years also support this pattern: investigators repeatedly report comparable cycloplegic outcomes but note faster onset and recovery with tropicamide and less visual disruption (blur, photophobia) during the post-instillation period — factors that plausibly underlie lower anxiety and higher relaxation scores in the Trop group in our study. Where prior trials measured tolerability, they typically report broad tolerability or adverse-event rates rather than multi-item patient experience scales; our 18-item Likert instrument therefore adds granularity by showing which specific phases and perceptions differ (instillation anxiety, waiting period relaxation, worries about duration, stinging, progressive discomfort, and light sensitivity). [2s0]

CONCLUSION

The study concluded that Tropicamide with phenylephrine was associated with greater overall comfort, satisfaction, and tolerance compared to Cyclopentolate, which showed higher levels of anxiety, discomfort, and light sensitivity. No significant between-group differences were found with regard to the patient's reassurance, explanation quality and provider communication during cycloplegic refraction.

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