Prevalence of Under-corrected Refractive Error and Prescription Gaps Among University Students: A Retrospective Research Report

Alecx Kriz A. Fajardo

SAERA. School of Advanced Education Research and Accreditation

ABSTRACT

This research report investigated the prevalence of under-corrected refractive error and the magnitude of the prescription gap among university students evaluated at the Centro Escolar University Vision and Eye Care Center. The study employed a quantitative, retrospective record review to determine the adequacy of students' current optical interventions. Data were gathered from 200 archived clinical records of tertiary students aged 17 to 26 years. The study compared habitual spectacle prescriptions, verified via lensometry, against true refractive requirements determined through clinical manifest refraction. A prescription gap was operationalized as a Spherical Equivalent (SE) difference strictly greater than 0.50 Diopters or an independent visual acuity improvement of at least one line (≥ 0.1 logMAR) on a digital chart. The results revealed that 54.00% of the sample wore under-corrected spectacles. A Wilcoxon signed-rank test confirmed a statistically significant discrepancy between habitual and manifest refractions ($p < 0.001$). Notably, while the mean dioptric gap was mathematically modest (0.375 D), 63.50% of students were systematically under-minused, and 46.00% achieved clinically meaningful visual acuity improvements with a new prescription. These findings suggest that many university student patients were wearing spectacle prescriptions that differed from their current refractive status, potentially affecting visual performance during academically demanding activities.

Keywords: *under-corrected refractive error, prescription gap, university students, spherical equivalent, visual acuity, retrospective review*

INTRODUCTION

According to Bourne et al. (2021), unaddressed refractive error acts as a primary driver of preventable vision impairment globally. While international health initiatives have achieved success in mitigating absolute blindness, the incidence of moderate visual impairment—specifically uncorrected refractive errors—continues to rise globally. This phenomenon suggests a systemic challenge in translating eye care access into functional visual outcomes. Within the context of higher education, this issue is amplified by the unique physiological and environmental demands placed upon the student body. University students represent a critical demographic for longitudinal ocular health analysis. Bullimore et al. (2023) and Bourne et al. (2021) reported that sustained near-work demands may be associated with refractive changes among young adults.

As students navigate the transition from late adolescence into young adulthood, their refractive status is subjected to the sustained stress of intensive reading, laboratory analysis, and prolonged digital engagement. Emerging empirical research challenges the traditional clinical assumption that refractive states stabilize after adolescence, suggesting that the intensive near-work inherent in tertiary education has been associated with dynamic shifts often termed "adult myopia progression" (Bullimore et al., 2023; Hammood et al., 2025), which renders existing spectacles inaccurate. The significance of addressing these refractive shifts extends beyond the clinical sphere into the academic and daily functional potential of the individual. Chronic, uncorrected vision impairment may contribute to significant visual discomfort, reduced concentration, and impaired visual efficiency (Bennett et al., 2019). When students rely on obsolete optical prescriptions, they may navigate a high-stakes academic environment with chronic, preventable blur. This creates a "paradox of access," where tertiary institutions may provide the infrastructure for eye care, yet the students themselves may not benefit due to a false sense of security derived from their initial, now-outdated spectacles (Vankudre & Noushad, 2021).

Consequently, this research seeks to move beyond the narrow documentation of refractive error prevalence by examining the functional accuracy of optical correction among university students. This study is conceptually informed by literature on refractive stability and functional vision. Evidence suggests that refractive status may continue to change during young adulthood, particularly among university students exposed to sustained near-work demands (Bullimore et al., 2023). Furthermore, functional vision emphasizes the practical visual performance achieved through optical correction rather than the mere possession of visual aids (Bennett et al., 2019). Together, these concepts support the need to quantify the prescription gap as an indicator of unmet visual correction needs among university students.

Conceptually, this study evaluates the students' presenting visual parameters, specifically their habitual spectacle correction documented via lensometry and

their presenting visual acuity. The comparative process involves a comprehensive clinical evaluation resulting in a new manifest refraction. The primary outcome of the study is the quantified prescription gap, operationalized mathematically as the dioptric difference in Spherical Equivalent and the functional improvement in visual acuity lines measured directly from physical spectacle wear. The specific objectives of this study are to determine the overall prevalence of under-corrected refractive error among tertiary-level students, to identify the habitual spectacle correction utilized by students prior to their clinical eye examination, and to quantify the prescription gap by measuring the dioptric difference between the habitual correction and the newly determined manifest refraction. Addressing these objectives provides insight into a critical paradox in collegiate eye care, wherein refractive errors remain highly prevalent despite physically accessible clinical services (Kamara et al., 2024; Rosman et al., 2009). By quantifying the inaccuracy of spectacles currently in circulation, this study provides vital empirical baseline data for university health policy, supporting the assertion of Putnam et al. (2019) that spectacle ownership alone is an insufficient indicator of functional visual health.

Furthermore, this study establishes a necessary empirical foundation for future interventions, ensuring that institutional support services are calibrated to the actual refractive requirements of a modern collegiate student population.

REVIEW OF LITERATURE

The global burden of visual impairment, as documented in landmark meta-analyses by Bourne et al. (2021), identifies unaddressed refractive error as a primary impediment to educational and socio-economic advancement. While clinical focus has traditionally remained fixed on pediatric populations, recent epidemiological data reveal a disturbing trend of progressive refractive change extending well into young adulthood. Longitudinal investigations indicate that myopia, once thought to stabilize in late adolescence, often continues to progress throughout the university years. For the university demographic, refractive status may continue to change throughout the university years, resulting in habitual spectacle prescriptions that may differ from an individual's current refractive findings. Such changes may contribute to low-grade visual blur during daily visual tasks.

The global prevalence of refractive error among university students has reached a critical threshold, with peer-reviewed literature increasingly identifying this demographic as a high-risk group for progressive ocular changes. Empirical evidence consistently demonstrates that university-level students are subject to unique refractive pressures. For example, a cross-sectional analysis by Al-Rashidi et al. (2018) highlighted that nearly 60% of medical students in their study exhibited uncorrected or inadequately corrected refractive errors, which directly impeded their clinical and academic efficiency. Similarly, longitudinal data from Shi et al. (2018) regarding first-year university

students revealed a high prevalence of vision impairment, a figure that underscores the magnitude of uncorrected refractive error in incoming collegiate cohorts. The prevalence of this issue is further supported by Kamara et al. (2024), who documented that university students at multiple institutions suffer from significant refractive errors that remain poorly managed due to the lack of routine clinical re-evaluations.

This persistent refractive instability is particularly critical given the unique demands of higher education. Emerging research indicates that visual clarity is a fundamental determinant of academic performance, as higher education necessitates high-speed information processing. When refractive errors remain uncorrected, the visual system may experience increased accommodative demand during prolonged near-work activities. Over time, this may contribute to visual discomfort and could affect sustained reading and other visually demanding academic tasks. Beyond traditional near-work, the "digital saturation" of modern tertiary education—involving prolonged exposure to high-resolution tablets and laptops—has been associated with increased visual demands and may contribute to refractive changes in young adults.

Recent literature has increasingly emphasized the influence of prolonged near-work and digital device exposure on the visual demands experienced by university students. Academic activities such as extensive reading, prolonged computer usage, and sustained engagement with digital learning platforms require continuous accommodative effort and sustained visual attention at near and intermediate distances. When refractive correction is no longer fully optimized, students may experience increased visual discomfort, reduced visual comfort, and difficulty maintaining prolonged visual focus during academic tasks. Several studies have suggested that persistent exposure to visually demanding environments may contribute to refractive changes over time, particularly among young adults engaged in intensive educational activities. Furthermore, the widespread integration of digital technology into higher education has increased the importance of maintaining accurate refractive correction, as prolonged screen exposure may exacerbate the visual impact of even minor uncorrected refractive errors. These findings highlight the importance of routine refractive reassessment and preventive ocular health strategies within university populations, where sustained visual clarity is essential for prolonged academic engagement.

In recent years, the transition toward technology-driven educational environments has substantially increased the visual burden placed upon university students. Online learning platforms, digital assignments, virtual lectures, and prolonged smartphone usage have become integral components of modern academic life, resulting in extended periods of continuous near-work. Unlike intermittent visual tasks, sustained screen exposure often requires prolonged accommodative and vergence activity, which may intensify symptoms of visual discomfort when refractive correction is inadequate or

outdated. Although some students may gradually adapt to mild blur or refractive inaccuracies, this adaptation may reduce the likelihood of seeking timely refractive reassessment, thereby prolonging the use of suboptimal spectacle prescriptions. Consequently, students may continue academic activities despite experiencing visual strain, intermittent headaches, or fluctuating visual clarity during prolonged reading and digital device usage. These trends reinforce the growing importance of preventive ocular health strategies, regular refractive evaluations, and increased awareness regarding the necessity of updated spectacle correction among university populations exposed to intensive visual demands.

The "prescription gap"—the discrepancy between an individual's current optical aid and their actual refractive requirement—is a pervasive challenge in tertiary settings. Even in structured healthcare environments, under-correction remains a significant challenge; Rosman et al. (2009) demonstrated that various socio-demographic factors and patient perceptions contribute to high rates of under-correction in adult populations, further complicating efforts to ensure functional visual outcomes. The work of Putnam et al. (2019) provides a rigorous methodological framework for this, demonstrating that objective lensometry frequently fails to align with manifest clinical requirements, thereby quantifying the prescription gap as a measurable, functional deficit.

Furthermore, clinical evidence does not support the historic practice of under-correction as a viable strategy to slow myopia progression; as noted by Logan and Wolffsohn (2020), it may negatively impact visual performance and daily functional comfort in high-demand environments. The psychosocial and behavioral factors contributing to this gap are equally documented. Vankudre and Noushad (2021) identified that a primary barrier to closing this gap is a "false sense of security" among students, who frequently normalize symptoms of visual fatigue—such as headaches and blurred distance vision—as an expected byproduct of their academic workload rather than their own outdated optical status. This behavior is compounded by the "paradox of access," where even when university-based eye care facilities are available, student utilization remains low, leading to prolonged periods of wearing obsolete optical aids. As highlighted by Hammood et al. (2025), the dynamic nature of myopia progression in university students necessitates that refractive status not be treated as static; instead, it requires iterative monitoring to ensure that optical corrections remain aligned with the evolving physiological needs of the student. Finally, the localized context remains vital; while Reyes and Uy (2010) established the prevalence of myopia in the local adult population, they did not address the functional accuracy of the visual aids utilized by students, leaving the "prescription gap" entirely unquantified in the local literature until this study. Ultimately, this literature confirms that institutional health policy must transition from passive, patient-initiated care toward a model of active, iterative ocular health management to effectively safeguard the

academic and ocular longevity of the collegiate population.

Need of the study

The existing landscape of ocular health literature, while vast regarding initial refractive diagnosis and general population prevalence, reveals a gap in the literature concerning the functional accuracy of optical aids in the university demographic. The current scientific discourse disproportionately fixates on the raw statistics of initial myopia diagnosis, often treating the provision of spectacles as the successful endpoint of clinical care. This narrow focus fails to address the "prescription gap"—the critical, quantifiable discrepancy between a student's habitual optical correction and their actual manifest refractive requirement. Within the Philippine context, this deficiency is particularly acute; the absence of localized, peer-reviewed clinical data regarding the longitudinal accuracy of spectacles worn by university students creates a distinct blind spot in campus health management.

The present research is necessitated by the observation that university-level students are not merely a standard population cohort, but a "high-demand" visual group. The academic environment may contribute to ongoing refractive changes among university students. By extracting and comparing habitual lensometry readings with finalized manifest refractions, this study replaces broad, often erroneous, assumptions about spectacle coverage with hard, dioptric evidence. The need for this study is underscored by the paradox wherein refractive errors remain highly prevalent despite the existence of accessible campus health facilities.

Documenting the precise magnitude of this prescription gap is a necessary pivot for university health policy. It harmonizes the overarching goals of campus health initiatives—which aim to support academic success—with the actual clinical reality that mere spectacle ownership is an insufficient metric for functional visual health. By empirically quantifying the inaccuracy of lenses currently in circulation, this research provides the necessary baseline data for developing targeted, proactive strategies, such as routine clinical re-evaluations, to safeguard ocular health and mitigate visual fatigue. Without this data, university programs continue to operate on a model of "passive ownership," which, as demonstrated by the current findings, is susceptible to chronic distance blur and other potential visual difficulties associated with outdated prescriptions. Consequently, this inquiry is vital to transforming ocular health from an auxiliary service into a core component of the student support infrastructure, ensuring that visual performance is never a limiting factor in the educational attainment of the next generation of scholars.

METHOD

Aim of the study

The primary objective of this retrospective study is to rigorously quantify the magnitude of visual under-correction—clinically termed the "prescription gap"—among university students evaluated at the

Vision and Eye Care Center of Centro Escolar University. By systematically extracting and analyzing data from archived clinical records, this research seeks to measure the precise dioptric discrepancy between a student's habitual spectacle correction (determined via lensometry) and their actual manifest refractive requirements.

Beyond mere quantification, the study aims to establish an empirical baseline of spectacle inaccuracy, shifting the focus of campus ocular health from the prevalence of refractive errors to the functional accuracy of the visual aids students currently utilize. Ultimately, this research intends to provide the objective, baseline data necessary to advocate for a transition in institutional policy—moving away from passive, one-time visual screenings toward a model of structured, iterative clinical re-evaluations that effectively mitigate visual fatigue and safeguard the ocular health of the student body.

Inclusion criteria

To ensure the data accurately reflects the target demographic and provides the precise optical metrics required for analysis, patient records selected for this review were required to meet strict, pre-defined parameters:

- Demographic Relevance: The clinical files must belong to patients actively enrolled in any college or university program at the time of their examination. Enrollment was not restricted to Centro Escolar University; students from any higher education institution evaluated at the Centro Escolar University Vision and Eye Care clinic were eligible.
- Age Parameter: Patients must be between the ages of 17 and 26 years old at the time of their clinical evaluation to specifically capture the traditional undergraduate and early graduate demographic.
- Clinical Completeness: Records were required to contain complete, verifiable lensometry data, detailing the sphere, cylinder, and axis of the patient's habitual spectacles, providing the foundational metrics for calculating the prescription gap.
- Comparative Baseline: There must be a corresponding, fully documented subjective manifest refraction on the same date of visit.
- Functional Metrics: The files were required to include recorded Snellen visual acuity scores for both the habitual presentation and the best-corrected state, allowing for the quantification of functional visual improvement.

Exclusion criteria

Records were disqualified if they introduced confounding clinical variables or failed to represent the specific collegiate demographic, as these factors would compromise the validity of the prescription gap calculation:

- Non-Target Demographics & Age Outliers: Any clinical files belonging to non-students or individuals falling outside the 17 to

26 age range (e.g., pediatric patients, older adult learners, or general walk-ins) were strictly excluded to maintain the developmental and academic homogeneity of the sample.

- Incomplete Data: Records lacking either the initial habitual lensometry or the final manifest refraction were discarded, as the primary mathematical calculation for the study would be impossible.
- Optical Confounders: Patients whose primary mode of optical correction was contact lenses were excluded. This was necessary due to the distinct accommodative demands, corneal physiology, and vertex distance variances associated with contact lens wear that are not comparable to spectacle-based refractive errors.
- Pathological Confounders: Records documenting active ocular pathologies (e.g., keratoconus, severe dry eye syndrome, or significant cataracts), clinically significant binocular vision anomalies like strabismus, or a history of refractive surgery were excluded. In these instances, visual deficits cannot be reliably attributed solely to simple optical under-correction, as the pathology introduces variables beyond the scope of this inquiry.

Procedure

A quantitative, retrospective record review design was deployed to objectively extract and analyze pre-existing clinical data without introducing observational bias, Hawthorne effects, or altering patient behavior. The investigation was localized at the Vision and Eye Care Center of Centro Escolar University. The study population consisted of university students who voluntarily sought optometric consultation and refractive assessment at the clinic during the study period. The respondents in this study were represented by their archived clinical charts rather than through direct human interaction.

Following the acquisition of necessary ethical and administrative clearances to access the clinic archives, consecutive sampling was utilized for data extraction. Eligible patient charts from the 2025 to 2026 academic timeframe were selected sequentially as they appeared in the archive until a target sample of 200 clinical records was fulfilled. To ensure strict adherence to data privacy regulations and the Data Privacy Act of 2012, all extracted clinical data were fully anonymized. Patient identifiers, such as names and student numbers, were stripped from the dataset and replaced with unique coded identifiers prior to analysis.

Relevant clinical endpoints—including age, sex, habitual dioptric power, manifest dioptric power, and functional visual acuity scores—were systematically transcribed into a secure spreadsheet (see Appendix B). Habitual spectacle prescriptions were verified objectively via a lensometer. Manifest refractions were determined subjectively using a phoropter or trial frame assembly. Crucially, functional visual acuity (VA) was measured using a digital visual acuity chart displayed on an LCD monitor, utilizing randomized Snellen optotypes

and converted to logMAR values for statistical consistency (see Appendix C).

Analysis

Raw refractive parameters extracted from the charts were mathematically converted into Spherical Equivalent (SE) values using the formula: Spherical Equivalent = Sphere + (Cylinder ÷ 2). This created a continuous variable for analysis while retaining the exact positive (+) and negative (-) signs to indicate the direction of the clinical error. Visual acuity data recorded in Snellen fractions were converted to logMAR values.

To accurately quantify the accuracy of the students' spectacles, the extracted data were categorically divided into three clinical groups: under-corrected, well-corrected, and over-corrected. A student was classified as under-corrected if at least one eye demonstrated a physical visual acuity improvement of 1 line (≥ 0.1 logMAR) or greater (Zhou et al., 2025), or an absolute Spherical Equivalent difference strictly greater than 0.50 Diopters (Shi et al., 2018). Students were classified as well-corrected (optimal) if their Spherical Equivalent difference remained within a ± 0.50 D margin of clinical tolerance without any significant visual acuity improvement. Finally, a classification for over-corrected was established for cases where habitual spectacles provided a positive Spherical Equivalent difference strictly greater than +0.50 D, indicating excessive minus power that can induce accommodative strain.

Statistical computations were facilitated using SPSS software. Descriptive statistics, encompassing frequencies, percentages, means, and standard deviations, were deployed to summarize the prevalence and average magnitude of the prescription gaps across the three categories. To capture any unilateral visual deficit, prevalence reporting utilized the "either eye" classification. This empirical investigation was guided by the null hypothesis that there is no statistically significant prescription gap between the university students' habitual spectacle correction and their manifest refraction, tested against the alternative hypothesis that a statistically significant discrepancy exists.

To test this, a Shapiro-Wilk test was first conducted to assess data normality. Based on those results, a Wilcoxon signed-rank test was executed to determine the statistical significance of the differences between habitual and manifest SE values. To strictly avoid the statistical violation of inter-eye correlation, this inferential test was performed exclusively on signed data extracted from the right eye (OD) of each participant.

RESULTS

Analysis of the 200 clinical records establishes a high prevalence of refractive mismatch among the collegiate cohort, demonstrating that 54.00% of participants operate with under-corrected spectacles. The remaining 46.00% maintained optimal visual correction with their habitual lenses, and notably, no individuals in the sample exhibited severe

over-correction exceeding the +0.50 Diopter threshold.

Table 1.

Distribution of respondents according to visual correction status

Classification	Frequency (f)	Percentage (%)
Optimal Vision	92	46.00
Under-corrected	108	54.00
Total	200	100.00

Demographic stratification reveals a pronounced vulnerability among female participants, who constituted a disproportionate 66.67% of the under-corrected subset. Furthermore, an age-based trend emerged indicating that younger scholars, specifically the 19- and 20-year-old cohorts, experienced substantial rates of optical under-correction. Conversely, older demographics nearing the completion of their studies (ages 23 to 25) exhibited a higher frequency of optimal visual acuity.

Baseline refractive assessments confirmed a predominant myopic tendency within the sample. Habitual clinical evaluations yielded a mean spherical equivalent (SE) of -2.56 D (SD = 1.700) for the right eye and -2.44 D (SD = 1.680) for the left eye, which translated to functional visual acuities of 0.11 logMAR and 0.09 logMAR, respectively. Following clinical intervention, the finalized manifest refractions—averaging -2.87 D (SD = 1.820) OD and -2.70 D (SD = 1.780) OS—successfully restored best-corrected visual acuity to near-normal visual acuity levels of 0.0015 logMAR and 0.0012 logMAR.

Given the violation of normality assumptions within the dataset, non-parametric inferential analysis was mandated. A Wilcoxon signed-rank test, strictly isolated to the right eye to preserve the independence of clinical observations, confirmed a highly significant dioptric discrepancy between habitual and manifest refractive states ($W = 9529$, $p < 0.001$), decisively rejecting the null hypothesis. The mean magnitude of this underlying prescription gap was mathematically calculated at 0.375 D.

Table 2.

Wilcoxon signed-rank test between habitual and manifest refraction (OD)

Paired Variables	Test statistics (W)	p-value	Decision	Mean difference (D)
Habitual Rx SE vs. Manifest Rx SE (OD)	9529	< 0.001	Significant	0.375

Directional categorization of this refractive error revealed that 63.50% of the assessed right eyes were under-minused, indicating that the population is chronically exposed to inadequate

negative dioptric power. Only 8.50% exhibited an over-minused shift.

Table 3.

Classification of prescription error based on direction of spherical equivalent difference (OD)

Classification of prescription error	Frequency (f)	Percentage (%)
No change	56	28.00
Under-minused	127	63.50
Over-minused	17	8.50
Total	200	100.00

While the population-level mean gap fell mathematically below the standard 0.50 D threshold for clinical significance, an isolated dioptric analysis inherently obscures the true functional deficit. A thorough evaluation of clinical limits demonstrated that 19.00% of the sample still exhibited a severe dioptric gap exceeding 0.50 D in the right eye. More critically, functional metrics proved that the application of manifest refraction yielded a mean visual acuity improvement of 0.13 logMAR in the right eye, enabling 46.00% of the cohort to achieve a clinically meaningful gain of at least one full line of vision

Table 4.

Distribution of visual acuity improvement based on clinical threshold (OD)

Improvement category	Frequency (f)	Percentage (%)
< 0.10 logMAR (No clinically meaningful improvement)	108	54.00
≥ 0.10 logMAR (Clinically meaningful improvement)	92	46.00
Total	200	100.00

DISCUSSION

The findings of this retrospective study indicate that 54.00% of the university student population evaluated at the Centro Escolar University Vision and Eye Care Center presented with under-corrected refractive error, as defined by an absolute Spherical Equivalent (SE) difference greater than 0.50 D or a logMAR visual acuity improvement of at least 0.10. The Wilcoxon signed-rank test confirmed a statistically significant discrepancy between habitual and manifest refractions ($p < 0.001$), with 63.50% of assessed right eyes exhibiting an under-minused refractive state. These results suggest that a substantial proportion of this cohort was wearing spectacle prescriptions that

differed from their current manifest refractive findings, indicating that refractive status may change over time in visually demanding university environments.

The observed prevalence of under-correction (54.00%) aligns with studies identifying refractive instability in young adult populations. While this figure is lower than the 84.39% reported by Shi et al. (2018) in incoming university students and the 60% noted by Al-Rashidi et al. (2018) in medical cohorts, the variation may be attributed to differences in institutional screening policies, regional myopia prevalence, and the specific academic demands of the study populations. The data reinforce findings by Hammood et al. (2025) that refractive shifts in university students are dynamic, necessitating that refractive status be treated as a variable requiring periodic monitoring rather than a static state. The persistence of under-correction globally, as discussed by Rosman et al. (2009), suggests that this issue is a broad challenge influenced by varying levels of healthcare access and patient awareness.

The high prevalence of an under-minused refractive state (63.50%) suggests a complex interplay between refractive progression and behavioral adaptation. University students represent a highly visually demanding population, frequently engaged in sustained near-work and digital screen use that requires precise refractive accuracy. The gradual nature of myopia progression often allows for a form of sensory adaptation to low-grade blur, where students may not perceive subtle changes in their distance vision until the deficit reaches a point of functional impairment. This adaptation, combined with a "false sense of security" described by Vankudre and Noushad (2021), may influence utilization rates of eye care services. Students may delay seeking updated prescriptions, attributing minor visual discomfort to environmental factors, such as intensive study schedules or excessive digital device use, rather than to the degradation of their refractive correction. As Logan and Wolffsohn (2020) indicated, the practice of under-correction is not supported by clinical evidence as a strategy to stabilize myopia, and such under-correction may negatively affect visual performance in high-demand academic settings.

Regarding the mean prescription gap of 0.375 D, although mathematically modest, its clinical significance is highlighted by the observation that 46.00% of the sample achieved a clinically meaningful improvement in best-corrected visual acuity of at least one line (≥ 0.10 logMAR). This finding suggests that SE metrics, while useful for population-level screening, may mask the functional impact of small dioptric discrepancies. In university students, whose visual systems are routinely pushed to their limit by dense text and screen-based information, even minor refractive discrepancies may increase visual demands. The improvement in visual acuity for nearly half the sample suggests that these refractive discrepancies may have been sufficient to reduce visual clarity and potentially contribute to visual discomfort. Small, uncorrected shifts—particularly in the astigmatic component—may be overlooked by students but are often the

primary drivers of the noted visual acuity gains during manifest refraction. Variability in individual blur tolerance may also explain why some students report satisfaction despite measurable refractive errors, whereas others achieve significant acuity gains with only slight dioptric adjustments.

The results also highlight the role of institutional accessibility. Although the students had access to a university-based vision center, a majority remained under-corrected, supporting the "paradox of access" previously documented in the literature. This suggests that mere availability of services may be insufficient to fully address changes in refractive status over time; rather, the integration of vision screening into standard university health services may be necessary to identify refractive gaps before they manifest as persistent visual strain. As suggested by Putnam et al. (2019), the objective measurement of habitual prescriptions against manifest refractions is a robust method to quantify this unmet clinical burden. Future institutional health policies could emphasize routine, annual refractive re-assessments and student awareness campaigns to encourage proactive ocular health management. By framing refractive updates as a standard part of student health, institutions may reduce reliance on prescriptions that no longer fully match students' current refractive findings and help mitigate potential visual discomfort associated with uncorrected refractive errors.

The results contribute to the limited localized data regarding refractive status in the Philippine university context. While Reyes and Uy (2010) established the high prevalence of myopia among young Filipino adults, this research extends that baseline by quantifying the functional adequacy of the spectacles currently in use. The findings underscore the importance of ongoing ocular health monitoring as students advance through higher education, a period characterized by persistent near-work and digital engagement. Future research, incorporating longitudinal tracking and standardized assessments, may further delineate the relationship between refractive stability, digital device usage, and the visual demands inherent in contemporary higher education. These insights support the necessity of institutional health policies that prioritize iterative ocular health management to effectively support students during their academic development.

Limitations

While this study provides a significant contribution to the understanding of the prescription gap among university students, several limitations must be acknowledged to provide appropriate context for the findings. An additional limitation of this study relates to the clinical source of the sample. All records were obtained from students who voluntarily attended the Centro Escolar University Vision and Eye Care Center for eye examinations or refractive assessment. Consequently, the study population may not be fully representative of the broader university student body, as individuals seeking eye care are more likely to have existing visual concerns or refractive complaints. This clinic-based sampling

approach may therefore overestimate the prevalence of under-corrected refractive error compared with the general student population. As such, the findings should be interpreted as representative of university student patients attending the clinic rather than all university students. Furthermore, the retrospective design limited the availability of information regarding binocular vision status, accommodative function, adaptation history, symptom severity, and patient-specific prescribing considerations. Consequently, not all observed prescription differences should be interpreted as evidence of inappropriate or inadequate prior care. Instead, the identified prescription gap should be viewed as a measure of refractive discrepancy between habitual spectacle correction and current clinical findings.

First, the study employed a retrospective record review, which inherently relies on the completeness and accuracy of previously documented clinical data. Although clinical records were strictly screened for completeness, the study was limited to the data available within the archives of the Vision and Eye Care Center, which may not capture the full diversity of refractive habits across all socio-economic strata of the broader student population.

Second, the study utilized a retrospective cross-sectional design, which captures a snapshot of the student's refractive status rather than a true longitudinal tracking of refractive progression over the entirety of their university tenure. While the data clearly indicate a significant discrepancy between habitual and manifest refractions, this design prevents the establishment of a definitive causal link between specific academic activities and the rate of refractive change over time. Future longitudinal research would be required to track individual students annually to better delineate the precise rate of potential refractive changes associated with intensive academic workloads.

Furthermore, the operationalization of the "prescription gap" using Spherical Equivalent (SE) and a $\geq$ 0.1 logMAR improvement, while consistent with established epidemiological frameworks, inherently simplifies complex optical phenomena. As noted by Putnam et al. (2019), SE is a mathematical average that may occasionally obscure the functional impact of uncorrected astigmatism or other binocular vision anomalies that were outside the scope of this record review. Additionally, the exclusion of contact lens wearers—necessary to maintain the uniformity of the spectacle-based dataset—means that the findings may not be representative of students who have already sought alternative, non-spectacle-based methods of refractive correction. Finally, because the study was localized to a single institution, the results, while indicative of a common problem, should be interpreted with caution when generalizing to university populations in different geographic or academic settings where environmental stressors may vary.

Clinical Implications

The identification of a substantial prescription gap—characterized by an under-minused refractive state in 63.50% of the sample—carries important clinical

implications for ocular health management among tertiary students. Accurate refractive correction remains essential within university settings, where students are routinely exposed to prolonged near-work demands, extensive reading, and sustained digital device usage. These visually demanding activities place continuous stress on the accommodative system and require sustained visual clarity. When habitual spectacle prescriptions no longer adequately compensate for refractive error, the visual system may compensate through increased accommodative effort, potentially contributing to visual discomfort and reduced visual comfort during prolonged academic activities. The clinical relevance of the 0.375 D mean prescription gap is further supported by the finding that nearly half of the cohort achieved improved visual acuity following refraction, suggesting that even modest refractive inaccuracies may be clinically meaningful in environments where sustained visual performance is required. These findings highlight the importance of early detection and timely prescription updating to maintain optimal visual function and minimize unnecessary visual strain among students engaged in high-demand academic activities.

Institutional and public health implications

The persistent prevalence of under-correction in a population with physical access to a campus clinic underscores the need for more proactive institutional ocular health strategies. Moving beyond a predominantly patient-initiated model of eye care, universities are well-positioned to integrate ocular health into broader student wellness initiatives. Implementing routine annual vision screenings as part of university medical clearance procedures may serve as an effective mechanism for the early identification of refractive discrepancies. When combined with student awareness campaigns, such initiatives may help reinforce the importance of periodic refractive reassessment and discourage the prolonged use of outdated spectacle prescriptions. Increasing the accessibility of campus-based optometric services, alongside proactive communication regarding the importance of regular refractive evaluations, may facilitate a transition toward preventive ocular health management. By prioritizing student ocular health, universities may help reduce the prevalence of under-corrected refractive error and support students in managing the visual demands associated with higher education environments.

Recommendations and future research

To build upon the baseline data established by this retrospective report, several directions for future research are warranted. Given that this study was localized to a single clinical center, multicenter investigations are recommended to determine the prevalence of the prescription gap across a more diverse range of urban and rural university settings, where varying environmental and socioeconomic factors may influence ocular health outcomes. Longitudinal follow-up studies are particularly necessary to track the progression of refractive changes over the course of a student's entire academic career, as this

would allow for a clearer understanding of potential refractive changes associated with prolonged academic visual demands. Future studies could also incorporate broader ocular metrics, such as standardized symptom-based assessments, binocular vision evaluations, and accommodative analysis, to provide a more holistic view of the visual challenges faced by students. Additionally, research specifically targeting the impact of digital screen exposure—using controlled measures of screen-time duration—could further elucidate the relationship between digital device usage and refractive shifts. Such inquiries may help to refine institutional screening protocols and support the development of evidence-based guidelines for maintaining visual clarity in high-demand academic environments.

CONCLUSION

This retrospective record review successfully quantified the magnitude of visual under-correction—the "prescription gap"—among university students, providing an empirical baseline that challenges the assumption that spectacle ownership equates to functional visual health. By shifting the clinical focus from the mere prevalence of refractive error to the functional accuracy of the visual aids students actually wear, this study has demonstrated that the university environment represents a unique setting characterized by substantial visual demands that may be associated with refractive changes. The evidence confirms that a statistically significant prescription gap exists, indicating that the intensive near-work demands of higher education may contribute to refractive shifts that may reduce the accuracy of habitual spectacle prescriptions over time. This finding provides strong support for moving beyond one-time visual screenings toward a more robust, institutionalized model of visual care.

The implications of this research are significant for university health policy and student welfare. By documenting that 54.00% of the sample remained under-corrected, this study highlights an important gap in ongoing refractive care among university students. The prevalence of the under-minused state suggests that many students may be managing their academic workload with suboptimal visual correction. Although the present study did not directly assess academic performance, visual fatigue, or cognitive outcomes, persistent refractive inaccuracies may contribute to visual discomfort during prolonged academic activities. Consequently, the reliance on outdated optical aids is not a benign personal choice, but a functional impediment that the university must address to optimize the educational experience of its scholars.

Moving forward, the results of this inquiry necessitate a fundamental pivot in how campus ocular health is managed. Rather than relying on passive, patient-initiated visits to eye care centers, universities should implement routine, structured re-evaluations of spectacle accuracy as a standard component of student health services. Future research should leverage this methodology to conduct multi-center studies across diverse urban and rural

tertiary institutions to further delineate the socioeconomic and educational barriers driving this utilization deficit in young adult eye care. Only by integrating iterative visual management into the institutional framework can universities ensure that their students possess the visual clarity required for success in a modern, information-intensive academic world. Ultimately, this research validates that protecting ocular health is as essential to academic excellence as any other institutional support service, transforming vision care from an auxiliary concern into a central pillar of student academic success and long-term health.

REFERENCES

Al-Rashidi, S. H., Albahouth, A. A., Althwini, W. A., Alsohibani, A. A., Alnughaymishi, A. A., Alsaeed, A. A., Al-Rashidi, F. H., & Almatrafi, S. (2018). Prevalence of refractive errors among medical students of Qassim University, Saudi Arabia: Cross-sectional descriptive study. *Open Access Macedonian Journal of Medical Sciences*, *6*(5), 940–943. https://doi.org/10.3889/oamjms.2018.197

Bennett, C. R., Bauer, C. M., Bailin, E. S., & Merabet, L. B. (2019). The assessment of visual function and functional vision. *Seminars in Pediatric Neurology, 31,* 30–40. https://doi.org/10.1016/j.spen.2019.05.006

Bourne, R. R. A., Steinmetz, J. D., Flaxman, S., Briant, P. S., Taylor, H. R., Resnikoff, S., Casson, R. J., Abdoli, A., Abu-Gharbieh, E., Afshin, A., Ahmadieh, H., Akalu, Y., & Vision Loss Expert Group of the Global Burden of Disease Study. (2021). Trends in prevalence of blindness and distance and near vision impairment over 30 years: An analysis for the Global Burden of Disease Study. *The Lancet Global Health*, *9*(2), e130–e143. https://doi.org/10.1016/S2214-109X(20)30425-3

Bullimore, M. A., Lee, S. S. Y., Schmid, K. L., Rozema, J. J., Leveziel, N., Mallen, E. A. H., Jacobsen, N., Iribarren, R., Verkicharla, P. K., Polling, J. R., & Chamberlain, P. (2023). IMI—Onset and progression of myopia in young adults. *Investigative Ophthalmology & Visual Science*, *64*(6), 2. https://doi.org/10.1167/iovs.64.6.2

Hammood, H. L., Hadi, H. R., Al-Mosawi, R. H., & Hussein, A. F. A. (2025). Myopia: An increasing problem for Iraqi medical students at the university of Babylon: A cross-sectional study. *Discover Education*, *4*(1), Article 553. https://doi.org/10.1007/s44217-025-00974-w

Kamara, D., Onyango, J., Arunga, S., Pius, M., Tusingwire, P. D., Ayoo, M. A., Mulongo, E. R., & Atwiine, B. (2024). Prevalence and factors

associated with refractive errors among university students at Mbarara University of Science and Technology, Uganda. *Open Journal of Ophthalmology*, *14*(3), 324–338. https://doi.org/10.4236/ojoph.2024.143030

Logan, N. S., & Wolffsohn, J. S. (2020). Role of un-correction, under-correction and over-correction of myopia as a strategy for slowing myopic progression. *Clinical and Experimental Optometry, 103*(2), 133–137. https://doi.org/10.1111/cxo.12978

Putnam, N. M., Vasudevan, B., Juarez, A., Le, C. T., Sam, K., de Gracia, P., & Hoppert, A. (2019). Comparing habitual and i.Scription refractions. *BMC Ophthalmology*, *19*(1), Article 49. https://doi.org/10.1186/s12886-019-1053-x

Reyes, K. B., & Uy, H. S. (2010). Refractive errors in Filipino eyes in a single-center study population. *Philippine Journal of Ophthalmology*, *35*(2), 78–84.

Rosman, M., Wong, T. Y., Tay, W. T., Tong, L., & Saw, S. M. (2009). Prevalence and risk factors of undercorrected refractive errors among Singaporean Malay adults: The Singapore Malay Eye Study. *Investigative Ophthalmology & Visual Science*, *50*(8), 3621–3628. https://doi.org/10.1167/iovs.08-2788

Shi, X. Y., Ke, Y. F., Jin, N., Zhang, H. M., Wei, R. H., & Li, X. R. (2018). The prevalence of vision impairment and refractive error in 3654 first year students at Tianjin Medical University. *International Journal of Ophthalmology*, *11*(10), 1698–1703. https://doi.org/10.18240/ijo.2018.10.19

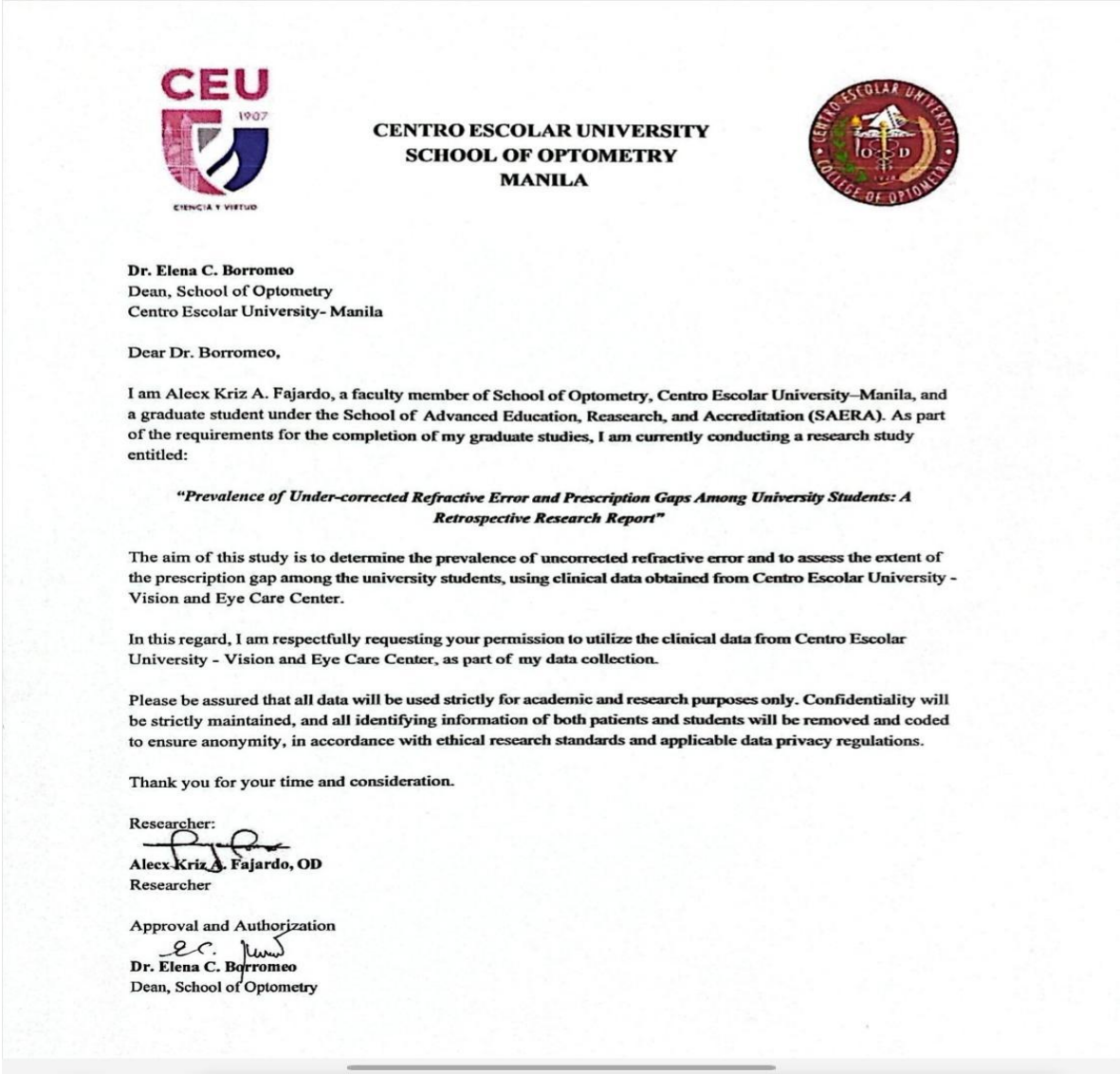
Vankudre, G. S., & Noushad, B. (2021). Barriers and perception towards spectacle wear among a student population of University of Buraimi, Oman. *Sultan Qaboos University Medical Journal*, *21*(3), 416–422. https://doi.org/10.18295/squmj.4.2021.004

Zhou, Y., Cai, Q., Chen, X., Huang, X., Sun, Z., Song, Y., Li, L., Zhu, Y., Yong, W., & Lu, P. (2025). Uncorrected refractive errors, visual impairment and need for spectacles among children and adolescents in eastern China. *PLOS ONE*, *20*(9), e0332142. https://doi.org/10.1371/journal.pone.0332142

APPENDIX

Letter of Approval for Data Collection

Appendix A



CENTRO ESCOLAR UNIVERSITY
SCHOOL OF OPTOMETRY
MANILA

Dr. Elena C. Borromeo
Dean, School of Optometry
Centro Escolar University- Manila

Dear Dr. Borromeo,

I am Alecx Kriz A. Fajardo, a faculty member of School of Optometry, Centro Escolar University–Manila, and a graduate student under the School of Advanced Education, Reasearch, and Accreditation (SAERA). As part of the requirements for the completion of my graduate studies, I am currently conducting a research study entitled:

"Prevalence of Under-corrected Refractive Error and Prescription Gaps Among University Students: A Retrospective Research Report"

The aim of this study is to determine the prevalence of uncorrected refractive error and to assess the extent of the prescription gap among the university students, using clinical data obtained from Centro Escolar University - Vision and Eye Care Center.

In this regard, I am respectfully requesting your permission to utilize the clinical data from Centro Escolar University - Vision and Eye Care Center, as part of my data collection.

Please be assured that all data will be used strictly for academic and research purposes only. Confidentiality will be strictly maintained, and all identifying information of both patients and students will be removed and coded to ensure anonymity, in accordance with ethical research standards and applicable data privacy regulations.

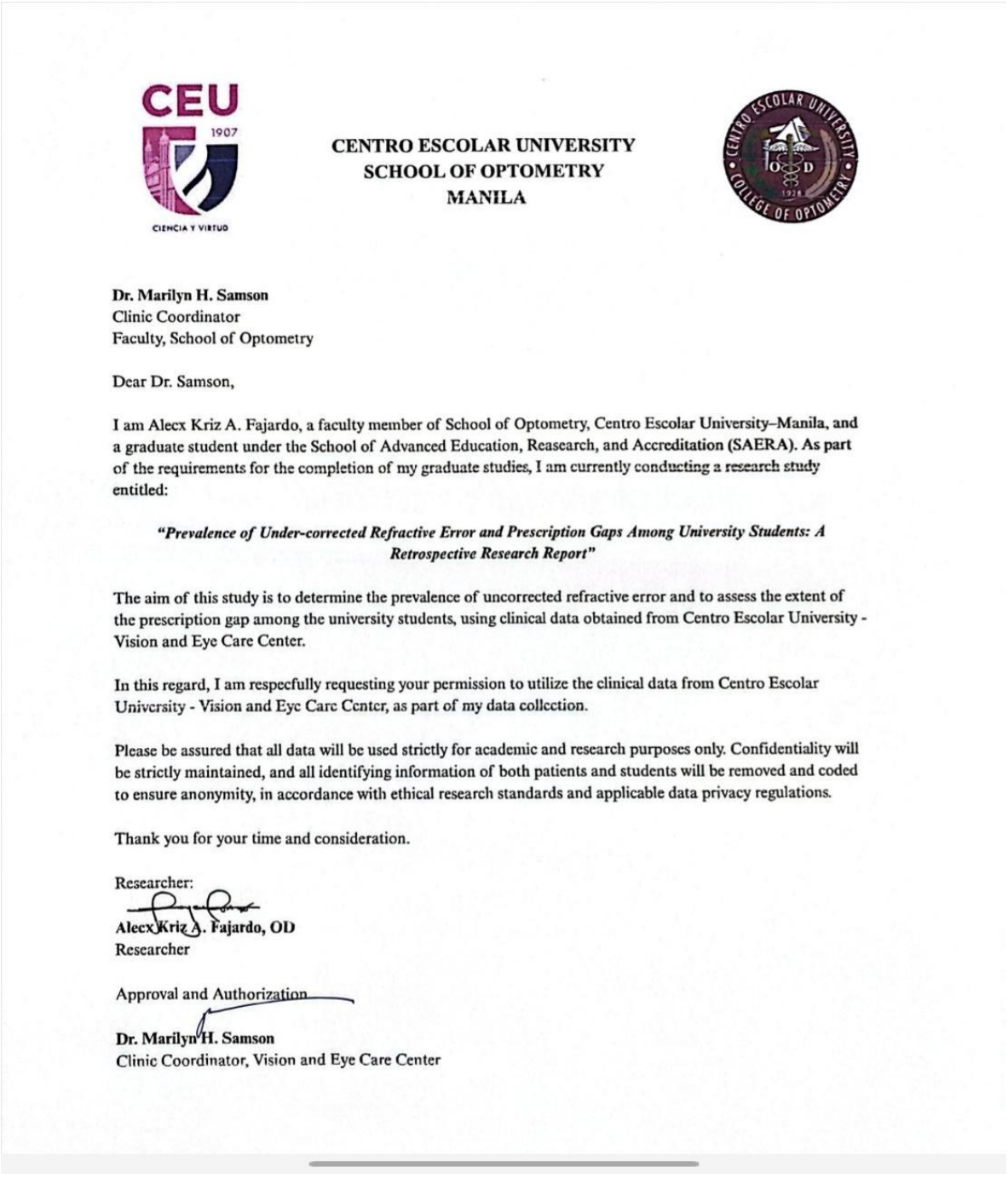
Thank you for your time and consideration.

Researcher:

Alecx Kriz A. Fajardo, OD
Researcher

Approval and Authorization

Dr. Elena C. Borromeo
Dean, School of Optometry



CENTRO ESCOLAR UNIVERSITY
SCHOOL OF OPTOMETRY
MANILA

Dr. Marilyn H. Samson
Clinic Coordinator
Faculty, School of Optometry

Dear Dr. Samson,

I am Alecx Kriz A. Fajardo, a faculty member of School of Optometry, Centro Escolar University–Manila, and a graduate student under the School of Advanced Education, Reasearch, and Accreditation (SAERA). As part of the requirements for the completion of my graduate studies, I am currently conducting a research study entitled:

"Prevalence of Under-corrected Refractive Error and Prescription Gaps Among University Students: A Retrospective Research Report"

The aim of this study is to determine the prevalence of uncorrected refractive error and to assess the extent of the prescription gap among the university students, using clinical data obtained from Centro Escolar University - Vision and Eye Care Center.

In this regard, I am respectfully requesting your permission to utilize the clinical data from Centro Escolar University - Vision and Eye Care Center, as part of my data collection.

Please be assured that all data will be used strictly for academic and research purposes only. Confidentiality will be strictly maintained, and all identifying information of both patients and students will be removed and coded to ensure anonymity, in accordance with ethical research standards and applicable data privacy regulations.

Thank you for your time and consideration.

Researcher:

Alecx Kriz A. Fajardo, OD
Researcher

Approval and Authorization

Dr. Marilyn H. Samson
Clinic Coordinator, Vision and Eye Care Center

Appendix B

Data Extraction Sheet

	A	B	C	D	E	F	G	H
1	DATA #	CASE #	UNDERCORRECTED OR OPTIMAL VISION	TEAM	CLINICIAN	PATIENT AGE	GENDER	PATIENT COURSE/ STATUS
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

	I	J	K	L	M	N	O	P	Q	R
1	HABITUAL RX (OD)	HABITUAL RX (OS)	HABITUAL VA (OD)	HABITUAL VA (OS)	RX DATE	NEW RX (OD)	NEW RX (OS)	BCVA (OD)	BCVA (OS)	RX DATE
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										

	HABITUAL RX (OD)	HABITUAL RX (OS)	HABITUAL VA (OD)	HABITUAL VA (OS)	NEW RX (OD)	NEW RX (OS)	BCVA (OD)	BCVA (OS)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

	Q	R	S	T	U	V	W	X
1	HABITUAL RX SE (OD)	NEW RX SE (OD)	DIFFERENCE SE (OD) w/ sign	DIFFERENCE SE (OD) w/o sign	HABITUAL RX SE (OS)	NEW RX SE (OS)	DIFFERENCE SE (OS) w/ sign	DIFFERENCE (OS) w/o sign
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

	DIFFERENCE SE (OS) w/ sign	DIFFERENCE (OS) w/o sign	HABITUAL VA (OD) LOGMAR	BCVA (OD) LOGMAR	DIFFERENCE (OD)	HABITUAL VA (OS) LOGMAR	BCVA (OS) LOGMAR	DIFFERENCE (OS)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Appendix C

Snellen to logMAR Conversion Table

Snellen Fraction	logMAR Equivalent
20/20	0.00
20/25	0.10
20/30	0.18
20/40	0.30
20/50	0.40
20/63	0.50
20/70	0.54
20/80	0.60
20/100	0.70
20/200	1.00