Cosmetic contact lens awareness, procurement and usage amongst students at a university in Cape Town South Africa

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Cosmetic contact lens awareness, procurement and usage amongst students at a university in Cape Town South Africa - a descriptive study

by

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DECLARATION

I, Angelique Hendricks, declare that:

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ii. This dissertation has not been submitted for any degree or examination at any other university
iii. This dissertation does not contain any other persons's data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.
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DEDICATION

This thesis is dedicated to my loving husband, whose support and perseverance has motivated me through the many trials and tribulations of my study journey; and to my precious daughters, who have embraced my research journey selflessly.
To my parents and sisters, who cheered me on throughout the process, and demonstrated their faith in me; and to my church family who carried me in prayer at my lows and celebrated my victories. Above all, I dedicate this to my Heavenly Father.

For Kurt, Gabriella and Adrianna

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CHAPTER 1: INTRODUCTION

The study documented in this academic thesis aimed to describe the exposure, procurement and usage of cosmetic contact lenses (CCLs) amongst young adults in Cape Town, South Africa. The researcher furthermore aimed to describe the relationship between mode of procurement and the CCL usage practices of the wearers.

1.1 BACKGROUND

Contact lenses used for decorative cosmetic effects, have been classified as devices falling within the scope of practice of optometrists by the regulatory authorities of a number of countries, including South Africa (South African National Department of Health, 2007), but remain unregulated in many other countries, such as China (Chan, et al., 2013). For regulated countries, a comprehensive eye examination is required prior to fitting and supplying CCLs. In South Africa, the distribution of contact lenses by unregistered persons is illegal, yet sporadic cases of unregulated sales from non-optometric vendors continue to be reported in the media (SAPA, 2007) and to the statutory body (Sloane, 2013).

The use of contact lenses for decorative cosmetic effect has increased in popularity amongst younger population groups worldwide (Morgan & Efron, 2009). This could be as a result of these lenses being portrayed in popular culture as an easy method to temporarily and significantly change your appearance (Entertainment Industries Council, 2014).

Evidence of CCL-related adverse events have been reported by numerous studies over the past decade both internationally (Steinemann, et al., 2003; Guyomarch, et al., 2010; Singh, et al., 2012), and locally (van Zyl & Cook, 2010). The study designs have typically been observational case reports identified in clinical practice settings, and describe cases of young adults, ranging in age from 14 to 37 years with varying levels of ocular morbidity following CCL misuse.

The CCL is essentially a foreign body which rests on the cornea (Bruce & Little, 2006) and has been proven to alter the anatomy, physiology and microbiology of the ocular surface (Ridder, 2006; Shovelin, 2013). The CCL also exposes the ocular surface to mechanical and chemical insult (Abdelkader, 2014), owing to the physical properties of the lenses, as well as their surface pigments, dyes and the chemical composition of disinfection systems (Cho & Chan, 2012; Chan, et al., 2013).

CCL wearer non-compliance (Claydon & Efron, 1994) and unhygienic practices have been identified as risk factors for microbial keratitis (MK) (Hickson-Curran, et al., 2011) (Sauer & Bourcier, 2011). Poor usage practices such as exposing CCLs to tap water (Guyomarch, et al., 2010), sleeping in lenses (Singh, et al., 2012) and sharing of CCLs among friends (Abdelkader, 2014) are common across the globe.

A recent systematic review of 6 clinical studies and 871 subjects, on the safety of CCLs concluded that these lenses proved safe when properly prescribed by an eye care professional and used in a compliant manner (Raj, et al., 2013). Despite these findings, there has been increasing evidence of sight-threatening complications relating to the unmonitored use of CCLs by uninformed young consumers.

Exacerbating the problem of harmful CCL practices is “over the counter” procurement and distribution of CCLs (Steinemann, et al., 2003). Chan et al have noted that the quality of these CCLs is a matter of concern (Chan, et al., 2013), as the unregulated nature of these products allows for many deviations from the standards set by regulatory authorities. Non-optometric vendors have been reported to include internet sites, fashion and beauty retail outlets, flea markets and convenience stores (Cavanagh, 2003; Steinemann, et al., 2005).

In South Africa, over the counter CCL sales have been reported, as not only arising from unregulated vendors, but also from optometric practices where CCLs are provided to patients without observing the necessary standards of professional care (van Zyl & Cook, 2010). The HPCSA guidelines on contact lens fitting emphasizes the need for strict protocols to be followed regarding patient suitability, pre-fitting clinical assessment, tolerance trials, dispensing and aftercare (HPCSA,

n.d.). The guidelines also call for the provision of written instructions to the patient; an appeal resonated by current international consensus (Roberts, et al., 2005; DePaolis, 2013).

1.2 RESEARCH PROBLEM STATEMENT

Indiscriminate procurement and usage practices relating to CCLs has potentially sight threatening consequences to young people who have varying levels of naiveté to their risks.

1.3 SIGNIFICANCE OF THE STUDY

Considering the risks associated with misuse and non-compliance in contact lens wear, an understanding of the practices in CCL exposure and wear amongst university students was necessary.

Few studies have been conducted on the awareness, procurement and usage practices related to CCLs in the South African context. This study therefore contributed to knowledge base of the South African ophthalmic and greater medical communities as it aimed to describe the phenomenon of CCL procurement and usage among South African young adults. In addition, it contributed toward the development of public awareness initiatives, highlighting the need for the safe and responsible use of CCLs (Hendricks, 2014).

1.4 DEFINITION OF TERMS

'Exposure to CCLs' was classified as:

- 'non-exposed' was defined as having no awareness of CCLs;
- 'exposed to CCL knowledge' was defined as having awareness of- but having never worn CCLs; and
- 'exposed to CCL wear' was defined as having worn CCLs.

'Procurement practices' referred to the manner in which the CCLs were obtained. It included:

- the vendor (optometric or unregulated);
- the process (with or without a comprehensive optometric examination);
- the instruction and training (present or absent); and
- the follow-up and aftercare (annual, ad hoc or lacking).

'Usage practices' referred to any practices relating to CCL wear, handling, care and maintenance, known or unknown, in which CCL wearers had engaged.

'Procurement by unregulated means' referred to the practice of obtaining CCLs without the requisite comprehensive optometric examination or the appropriate instruction and training.

1.5 SUMMARY

Little is known regarding the awareness, procurement and usage of CCLs amongst South African wearers. Adverse events related to CCL misuse have received a great deal of scholarly attention internationally. It is in the interest of the South African public to conduct a study of this nature.

CHAPTER 2: LITERATURE REVIEW

In order to provide context for the study, and directed by the research problem statement, it was necessary to review the literature relevant to CCLs. A wide literature search was conducted, and included international as well as local sources. The researcher identified a number of themes related to CCLs, including:

- the rationale for CCL use;
- properties of CCLs
- CCL usage statistics and wearer profile;
- CCL procurement practices;
- ocular health in CCL wear; and
- reducing the risks in CCL wear.

This literature review guided the research project in terms of the research design, development of the research instruments and the comparative analysis of the research results.

2.1 RATIONALE FOR COSMETIC CONTACT LENS USE

Contact lens usage has become a commonplace alternative to refractive correction for a number of reasons, including convenience and cosmesis (Charm, et al., 2010). Soft contact lenses, first introduced in 1960 by Otto Wichterle, have a diameter slightly larger than the cornea and are typically produced from hydrophilic polymers (Groos, 2006). When compared with rigid lenses, soft lenses have the advantage of instant comfort and a reduced adaptation time (Bruce & Little, 2006). These features facilitate the ease of fit and comfort that have contributed to the increased popularity of soft contact lenses, accounting for nearly 90% of modern contact lens fittings.

Cosmetic tints on contact lenses may be utilized for a variety of reasons, including handling visibility, spectral filtration, reduction of photophobia and alteration of natural eye appearance (Gasson & Morris, 2010).

Opaque tinted contact lenses may be prosthetic, used to conceal unsightly corneal scars or correct iris abnormalities; therapeutic, offering control of the amount- or spectral distribution of light; or decorative, modifying the actual colour and

appearance of the eyes (Bruce, 2006). The latter are used largely for fashion and theatrical purposes. These lenses include vivid colour pigments, pictures, designs or branding, and are marketed as a quick and easy method to temporarily and significantly alter your appearance (Singh, et al., 2012).

2.3 PROPERTIES OF COSMETIC CONTACT LENSES

2.3.1 Materials and methods of manufacture

The processes of producing the decorative effects of cosmetic contact lenses have developed from non-optical industries such as fabric printing, lithography and photography and involve either a front-surface dot-matrix printed pattern or a laminate (sandwiched) construction (Efron, 2010).

Research conducted by Professor Pauline Cho in Hong Kong has demonstrated an association between surface-printed CCL and increased microbial adherence as compared to lenses with embedded or laminated pigments (Cho & Chan, 2012). Reduced comfort owing to the irregularity of the printed surface is common and the resultant irritation of the tarsal conjunctiva often leads to lens intolerance (Bruce, 2006, pp. 692-693).

Novartis subsidiary, Alcon, has recently released a CCL in silicone hydrogel (SiHg) material with its cosmetic pigment pattern described as being embedded into the back surface of the lens (Alcon , 2014). This may be viewed as a revolutionary method employed by industry to improve the safety of CCLs.

2.3.2 Oxygen Transmission

Large lenses and those creating decorative effects tend to have an increased lens thickness with a lower oxygen transmissibility (Dk/t) (Gasson & Morris, 2010). There is currently no international standard for minimum required Dk/t in contact lenses (Bruce, 2006) and this further contributes to the cosmetic contact lenses poor ocular performance and subsequent health risk. The recent response by lens manufacturers in producing these lenses in SiHg material (Alcon , 2014) has demonstrated a pro-active approach to promoting CCL safety. However, it is unlikely that those CCL wearers who procure lenses by unregulated means will benefit from these advances.

2.3.3 Dimensions and Fitting Characteristics

The majority of cosmetic contact lenses are manufactured in only one base curve. This has been highlighted as a problem by Moodley, who in a South African study, found that these lenses exhibit tight fit characteristics on African subjects when compared with Caucasian subjects (Moodley, 2009). Moodley has recommended that wearers of different ethnicities be included in wearer trials to ensure all wearers are catered for, as it has been noted that there is a high proportion of non-Caucasian individuals who engage in CCL wear (Gaume, et al., 2003).

2.4 COSMETIC CONTACT LENS USAGE STATISTICS AND WEARER PROFILE

A 12-year longitudinal practitioner survey in the United Kingdom reported a CCL prevalence of 4.6% of soft contact lens fits (Morgan & Efron, 2009). A similar study in Singapore incidentally observed 6% of emmetropic contact lens wearers, identifying them as CCL wearers (Charm, et al., 2010). Yet another study on prescribing patterns in India reported a 5% CCL wearer prevalence, tabulated against the global status of 3% and the Asian status at 20% (Thite, et al., 2013). Most recently, the CCL wearer prevalence in a Saudi Arabian cross-sectional study amongst female wearers was reported at 70.2% (Abahussin, et al., 2014).
The cross-sectional Saudi Arabian study collected data from a known, high-prevalence wearer group of female students. Females were more likely to use CCLs than males. This has been attributed to the cosmetic advantage offered by these lenses, which tends to attract more female wearers (Morgan & Efron, 2009).

2.5 COSMETIC CONTACT LENS PROCUREMENT PRACTICES

Contact lenses used for decorative cosmetic effects, have been classified as medical devices by the United States Food and Drug Administration (FDA: US Department of Health and Human Services, 2006). This classification places

decorative cosmetic contact lenses under the same regulatory requirements as for daily wear prescription contact lenses.

In South Africa, contact lenses are regulated to be dispensed only on the prescription of a registered optometrist (South African National Department of Health, 2007). However, with the introduction of plano decorative cosmetic contact lenses into the market, an unsafe practice of unregulated distribution of cosmetic contact lenses was birthed (Moodley, 2009). This informed the 2007 amendment to the regulation governing the professional scope of optometry (South African National Department of Health, 2007). Resulting from the change in wording of the optometric professional scope of practice to include “the supply and fitting of any contact lenses to members of the public”, the distribution of contact lenses by unregistered persons is now illegal in South Africa, and practitioners and the public have been urged to report these activities to the professional body or the police.

An Internet search using the Google Chrome search engine, inserting the Boolean phrase: “buy” AND "contact lenses" AND “online” "cape town" “colour OR tinted OR cosmetic” yielded 2 160 000 results. This, coupled with the periodic reports of storefront and newsagent sales of cosmetic contact lenses (Sloane, 2013), demonstrate an increased likelihood that cosmetic contact lenses will be procured by non-regulated means.

2.6 OCULAR HEALTH IN COSMETIC CONTACT LENS WEAR

2.6.1 Anatomy and Physiology of the Ocular Surface in Contact Lens Wear

The complex anatomy and physiology of the anterior ocular environment (Ridder, 2006), as well as the delicate balance of the normal ocular microbial flora are inextricably affected and altered by the presence of a contact lens (Bruce & Little, 2006). This places the patient at a higher risk for inflammatory, physiological or mechanically induced ocular effects (Cheung, et al., 2012), as well as for the rare but serious complication of microbial keratitis (Sweeney, et al., 2009).

2.6.2 Microbial Keratitis in Cosmetic Contact Lens Wear

Contact lens related microbial keratitis (MK) has proven to be a rare occurrence among the greater population of CL wearers (Keay & Stapleton, 2008), even among those patients who have occasional lapses in compliance (Hickson-Curran, et al., 2011). However, a study into plano cosmetic contact lenses established that infectious keratitis is not rare, but rather significantly increased and with it, the increased risk of ocular morbidity (Guyomarch, et al., 2010).

Sauer and Bourcier conducted a prospective case-control study over a 2 year period among 12 university Hospitals in France, to investigate the association between cosmetic contact lens wear and the occurrence of MK (Sauer & Bourcier, 2011). Thirty two cosmetic contact lens wearers with MK (cases) were compared with 224 non-cosmetic CL wearers with MK (controls). The study determined that the highest occurrence of cosmetic contact lens usage occurs amongst younger patients between the ages of 17 and 26 years (Sauer & Bourcier, 2011). These patients were occasional wearers and were shown to be uninformed of the risks associated with cosmetic contact lens wear. The patients described in the study demonstrated poor care and maintenance practices with the lenses, which were rarely dispensed by eye care professionals. The risk factors included: poor hand and lens hygiene practices; lenses obtained in an unregulated manner; lack of information on lens handling, care and hygiene; and lack of ophthalmic supervision.

Statistically significant findings were observed for each of these risk factors for contact lens related MK when comparing cases with controls. Gram negative bacteria including pseudomonas, was present in relatively equal proportions in both cases and controls whilst acanthamoeba was found in 31% cosmetic contact lens cases compared with only 5% of non-cosmetic contact lens controls. An association was drawn from the fact that cases were 2.4 times more likely to use domestic tap water to clean their lenses than controls. This association was also reported in the 2007 findings of Lee et al. and 79% of cases needed to be hospitalized compared with 51% of controls (Lee, et al., 2007). A final visual acuity of less than 20/200 was obtained for 60% of cases as compared with 13% of controls. This may be explained by the increased likelihood of the control group to be under ophthalmic supervision as compared with the case group.

2.6.3 Non-compliant use

A number of poor contact lens practices have been highlighted in literature, including the practice of sharing of lenses (Singh, et al., 2012), over wear, improper lens handling and storage and exposure of lenses to water (Lee, et al., 2007), all with potentially sight threatening consequences. (Guyomarch, et al., 2010; Singh, et al., 2012; Abdelkader, 2014).

Research into the reasons for poor compliance has attributed this problem to misunderstanding, complacency or a lack of instruction (Claydon & Efron, 1994). Even when obtained from an ECP, the patient may fail to follow the compliance guidelines (Claydon & Efron, 1994) if they are given at all (van Zyl & Cook, 2010). Patients remain unaware or uninformed of the risks (Sweeney, et al., 2009) as well as the proper care and maintenance of the lenses.

Wearing schedules for cosmetic contact lenses differ from that of standard refractive CLs in that they are worn on an occasional, as opposed to a daily basis (Singh, et al., 2012). According to research conducted by Yung et al., lenses worn on an occasional basis were found to be associated with MK-causing microorganisms (Yung, et al., 2007). Occasional wear has thus been identified as a risk factor for no-compliant use.

2.7 REDUCING THE RISKS OF COSMETIC CONTACT LENS WEAR

The Health Professions Council of South Africa (HPCSA) guideline on contact lens fitting (HPCSA, n.d.) emphasizes the requirement for strict protocols to be followed regarding patient suitability, pre-fitting clinical assessment, tolerance trials, dispensing and aftercare of all types of contact lenses, including with cosmetic contact lenses. The guidelines also call for the provision of written instructions to the patient.

2.7.1 Optometric Inadequacy in CCL Distribution

The 3-case reports observed at Groote Schuur Hospital in Cape Town by van Zyl and Cook (2010), highlighted the dangerous combination of a high risk patient profile, insufficient contact lens handling and care instructions, and a lack of follow-up care by optometrists. The authors claim that, although all 3 patients (between the ages of 14 and 19) had obtained their cosmetic contact lenses from optometric practices, no instruction on contact lens handling, care and follow-up was provided by the optometrists.

Anecdotal reports indicate that in recent years, the South African optometric community has been faced with an increase in profession-defeating practices such as advertising free items in attempts to tout patients, over-servicing, clinical negligence, medical aid fraud, attempts at lay-ownership and a tolerance of sub-standard products, to mention but a few. Despite many practitioners practicing competently and ethically, these practices by a few have had a negative impact on the public perception of optometry, leading to the ill-conceived view that optometrists are eyewear merchants who sell expensive contact lenses (DePaolis, 2013).

In a recent study in India, it was observed that casual and poorly monitored distribution and use of contact lenses- not specifically cosmetic contact lenses- often with no instruction or aftercare, is strongly associated with MK (Tuli, et al., 2009)**.**. Furthermore, the lack of proper instruction and guidance was implicated in this study as being most significantly associated with microbial contamination of lenses.

2.7.2 Health Compliance Model

According to a health compliance model proposed by Claydon & Efron, the correct use of cosmetic contact lenses may be reinforced by utilizing three interactive components; the practitioner who is dedicated to health care and patient education, the instructions which are simple, clear and provided both verbally and in writing, and finally, the informed patient (Claydon & Efron, 1994). In addition, the practice environment should have informed staff, who understand the protocols and routines and offer consistent advice. The aftercare should include repetition, demonstration and emphasis, whilst ensuring that the patient's

understanding is correct. Carnt, et al. state that any incorrect beliefs regarding their lens wear and care should be explored with patients, so that in stressing the correct facts, the incorrect belief may be rectified (Carnt, et al., 2011).

CHAPTER 3: RESEARCH APPROACH

3.1 AIM AND OBJECTIVES OF THE STUDY

The aim of this study was to describe the extent of cosmetic contact lens exposure, as well as the procurement and usage practices associated with cosmetic contact lenses amongst students attending a university in Cape Town, South Africa. In order to guide this study in achieving this aim, the following objectives were identified:

- ascertain the levels of exposure to cosmetic contact lenses amongst students attending a university in Cape Town, South Africa;
- describe the cosmetic contact lens usage practices amongst students attending a university in Cape Town South Africa;
- determine the cosmetic contact lens procurement practices of students attending a university in Cape Town South Africa; and
- describe the relationship between modes of procurement and cosmetic contact lens usage practices among students attending a university in Cape Town South Africa.

3.2 STUDY DESIGN

A cross-sectional descriptive study design was used as the primary research method for this study, employing a 2-phase sequential explanatory mixed-methods approach (Cresswell & Plano-Clarke, 2007). The reason for using a mixed-method approach in this study was that neither quantitative (QUAN) nor qualitative (QUAL) methods as a sole approach could fully address the research objectives (Cresswell & Plano-Clarke, 2011).

The sequential explanatory approach as described by Creswell and Plano-Clarke typifies a QUAN first phase of data collection and analysis, followed by a QUAL second phase which aimed to explain the QUAN results.

Although the study aimed to describe the extent of cosmetic contact lens exposure in the study population, the focus of this study was on the identification and follow-

up of CCL wearers with regard to their procurement and usage practices. The QUAL phase did not address the non-wearer group in any way. Thus the data collection during the QUAL phase was only from a small subset of the QUAN sample, which may be viewed as a limitation of this study.

The design of this study was able to:

- describe the demographic profile and characteristics of a sample of the study population;
- determine the exposure of the sample to CCLs;
- identify student attitudes and behaviours with regard to procurement and usage of CCLs, and
- follow up with wearers to explore their personal experiences relating to the procurement and usage of CCLs.

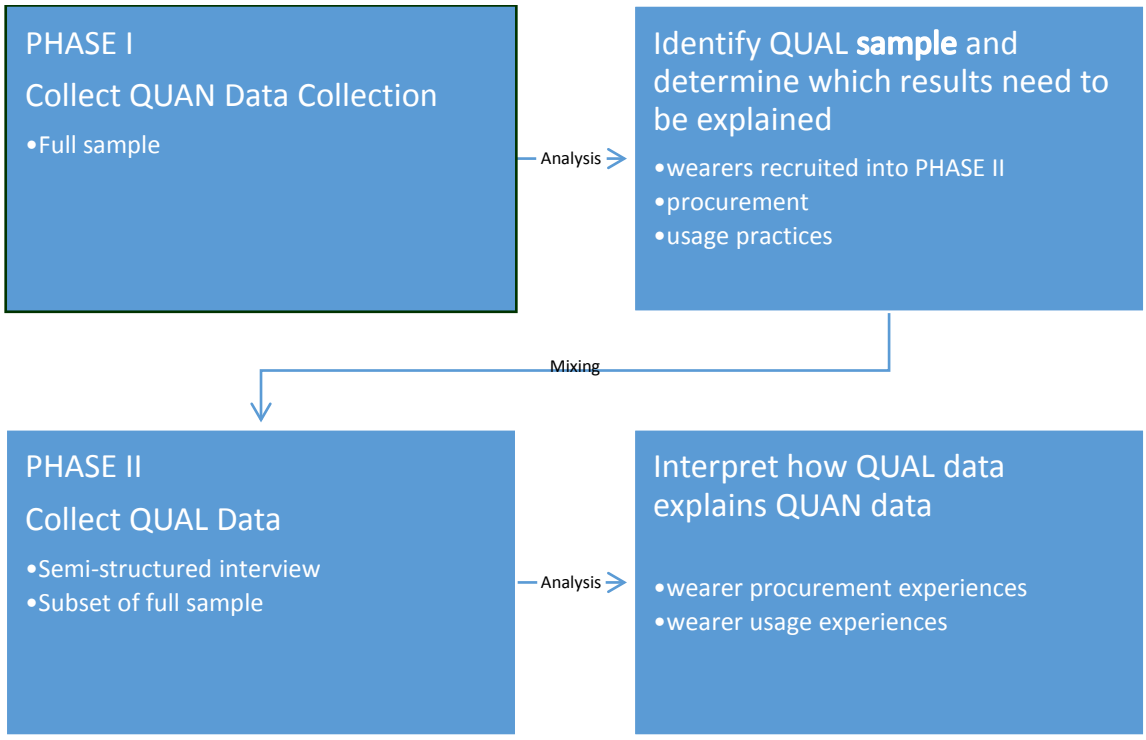

Figure 3.1: Process of Data Collection and Analysis

3.3 MATERIALS AND METHODS

3.3.1 Rationale for method of investigation

A review of the literature on CCL wear, described practitioner surveys as the primary methodology for obtaining wearer prevalence data (Morgan & Efron, 2009; Thite, et al., 2013). The researcher questioned the suitability of this method for determining wearer prevalence, as literature identified that CCLs were obtained from both optometric practices and unregulated sources (Fogel & Zidile, 2008; Sloane, 2013; SAPA, 2007).

An objective of this study was to describe procurement practices relating to CCL's, therefore it was not possible to merely survey practitioners, but rather to identify wearers within a population to explore these practices.

A study was conducted in Saudi Arabia that assessed the prevalence of contact lens wear by female university students, using a self-administered survey (Abahussin, et al., 2014). The population was, however, known to be a high prevalence wearer group, thus the questioning was specific to contact lens wearers. As the prevalence rate in the current study needed to be elucidated and due to the relatively low CCL wearer prevalence reported in the literature, it was necessary to employ a broad institutional survey to identify and recruit wearers into the study. A consecutive second phase was therefore necessary to pursue questions relating to procurement and usage experiences among wearers to explore procurement and usage practices.

A survey in Hong Kong describing practitioners' prescribing patterns of contact lenses, identified that timing CCL surveys to include festivals, such as Halloween, was necessary (Charm, et al., 2010). For this reason, the study was conducted over the last two weeks of October and first two weeks of November 2014.

3.3.2 Questionnaire design

The QUAN instrument comprised of a 2-part survey (Appendix B). Research questions regarding cosmetic contact lens usage perceptions and wearer characteristics, as well as procurement practices and wearer experiences, formed part of the self-administered questionnaire, which was physically distributed by the researcher to potential participants.

The demographic and profiling sections were followed by the exposure question which acted as a filter for further participation. Only the participants with knowledge of cosmetic contact lenses were required to progress to Section B: the perceptions and procurement components of the questionnaire. Those who selected "I have never heard of these lenses before today" were required to submit only Section A.

The participants who had awareness of- or experience with cosmetic contact lenses ('exposed') progressed to the 'Perceptions' component in Section B. The statements related to perceptions regarding the use of cosmetic contact lenses along the following themes: hygiene, ease of use/ handling, comfort, cost, health-risk, legal issues and the role of the eye care professional in cosmetic contact lens distribution and aftercare. A hypothetical scenario was suggested and participants answered questions relative to this scenario.

The participants from the 'exposed' group then selected potential modes of obtaining cosmetic contact lenses, with an option of selecting any of the following: a regulated purchase- worded as Optometrist/ eye-care professional; an unregulated physical vendor purchase (flea market, beauty salon), an internet purchase, a casual (possibly no cost) distribution (friend, night club) and an open-ended option for other distribution channels.

The final component of the questionnaire identified the 'wearer' group by asking about personal wearing experience. Wearers were then invited to provide their contact details at the end of the questionnaire in order for the researcher to

contact them to facilitate the semi-structured interview (QUAL) component of the study.

3.3.3 Semi-structured survey

During the subsequent QUAL phase of the proposed study, a semi- structured interview was used (Appendix C), and conducted over the WhatsApp instant messaging (IM) platform (WhatsApp Inc, 2014). This interview method has been described as an effective method of obtaining qualitative data whilst ensuring a sufficient response and retention rate when conducting one-on –one interviews (Stieger & Goritz, 2006). This interview was designed to probe all significant findings of the QUAN strand of the study with CCL wearers, so as to augment and seek to explain the QUAN findings (Cresswell & Plano-Clarke, 2011).

Cosmetic contact lens usage practices relating to procurement, training, comfort, compliance, hygiene and aftercare were identified as discussion points to probe during the interviews. Allowance was made for additional themes to be identified for consideration as to whether they could make a valuable contribution study.

3.4 STUDY POPULATION

The study population comprised of students at the Cape Peninsula University of Technology (CPUT), ranging from 18 to 35 years of age, who may or may not have been exposed to cosmetic contact lenses.

CPUT is the largest university in the Western Cape with a student population exceeding 33300 over five campuses (Cape Peninsula University of Technology, 2014). 94.52% of students registered at CPUT are undergraduates.

For the purposes of this study, only the student population pertaining to the campuses based in the Metropolitan region, Bellville (n=11 422), Cape Town (n=16 246) and Mowbray (n=2732) (n=30328), were considered, as these campuses represented each of the six faculties, and the most diverse array of academic disciplines at CPUT. The total student population for the purposes of this study was therefore n=30328.

The student distribution per faculty was as follows: Applied Sciences (n=3237); Business (n=11601); Education (n=3770); Engineering (n=8273); Health and

Wellness Sciences (n=2855); and Informatics and Design (n=3566) (Cape Peninsula University of Technology, 2014).

3.5 SAMPLING

3.5.1 Study sample

The sampling strategy used for the QUAN component of this study was the parallel use of cluster and purposive sampling (Bryman, 2012). The QUAL sample was a subset of the QUAN sample (Teddlie & Yu, 2007).

In addressing the QUAN strand of this study, it was desirable to ensure participation from all faculties. A sampling framework was employed, which aimed to recruit participants (Bryman, 2012) from clusters derived from the 6 faculties across the Metropolitan campuses of the institution.

As faculty sizes differed within the university, it was decided that two departmental clusters per faculty (only one cluster for Education) would be considered with the assumption that each departmental cluster would recruit between 30 and 50 participants into the study.

Considering the population of students across the three selected campuses at CPUT (n= 30328), the sample size for a population based study was 379 (rounded to 380). This was calculated considering a 95% confidence level and a 5% margin of error within a precision of 0.05 (Uys, 2014).

3.5.2 Inclusion criteria

a) QUAN Sample

In order for a departmental cluster to be included into the QUAN sample, only departments with at least one undergraduate programme categorised as full-time, contact were considered. This was because part-time students would be inaccessible for the purposes of this sampling strategy.

For this reason, the study also excluded postgraduate students. All undergraduate students between the ages of 18 and 35 years of age, who may or may not have been exposed to cosmetic contact lenses, were included in the study.

b) QUAL Sample

Only students who identified themselves as CCL wearers and who provided their contact details, were invited into the QUAL strand of this study. Non-wearers were not interviewed by the researcher.

3.5.3 Sampling Technique

a) QUAN Sample

The clusters were identified using a random sampling technique (Bryman, 2012), whereby each qualifying department in a faculty was given a number. Two numbers were then drawn for each of the 6 faculties, except for Education, which only had 1 number drawn.

Of the 9 departments in the faculty of Applied Sciences, numbers 5 and 7 were drawn which were linked to the Chemistry and Food Technology departments respectively. Numbers 5 and 14 were drawn from the Business faculty's 14 qualifying departments, representing the Human Resources and Tourism and Events Management departments respectively. The faculty of Education only had 2 qualifying departmental clusters, and number 1 was drawn, indicating the Further Education and Training department. The Engineering faculty offered 7 qualifying departmental clusters. Numbers 2 and 4 were drawn, including Chemical Engineering and Clothing and Textile Technology into the study. The faculty of Health and Wellness Sciences was divided into 6 departmental clusters, and numbers 3 and 4 were drawn, representing the departments of Emergency Medical Sciences and Wellness Sciences respectively. Lastly, the faculty of Informatics and Design comprised of 13 qualifying departments, of which numbers 3 and 9 were drawn, to select Fashion Design and Journalism into the study.

b) QUAL Sample

The QUAL sample was a purposive sample, identified as a subset of wearers in the QUAN sample.

3.5.4 Invitation to participate in the study

The departmental heads or programme coordinators of the 11 clusters were contacted by email (Appendix G) to request access to students in order to conduct the survey. The departmental contacts were requested to provide the researcher with a suitable time and venue to administer the survey.
Students were addressed by the researcher directly, either in groups, or, individually as required, based on the cluster- or purposive nature of the sample.

Participants in the QUAL strand were invited using the contact details supplied. This included both telephonic and electronic means of communication.

3.6 DATA COLLECTION PROCESS

3.6.1 Recruitment of participants

a) QUAN sample

Seven clusters were obtained from the faculty sampling strategy, after permission was obtained from the heads of departments (HODs) to access 7 of the 11 clusters. These included: from the faculty of Applied Sciences, Food Technology (Bellville Campus) and Analytical Chemistry (Cape Town Campus); from the faculty of Education, Further Education and Training; from the faculty of Engineering, Chemical Engineering (Cape Town Campus); from the faculty of Health and Wellness Sciences, Emergency Medical Sciences and Somatology; and from the faculty of Informatics and Design, Journalism.
The departmental management of the two Business faculty clusters and the Clothing and Textile Technology department, indicated that, owing to the time of year, they were unable to facilitate the roll-out of the survey, as their students were engaged in examinations. Although this was the case for most of the departmental clusters, the challenge of coordinating large class groups, as encountered by the Business faculty, made the task of a facilitated survey distribution unlikely. In addition to this obstacle, the Fashion Design departmental cluster failed to respond to further invitations to participate in the study.

Clusters 1, 3, 4 and 6 were obtained from departmental programmes on the Cape Town campus. Cluster 1 had 27 respondents from the faculty of Engineering, Cluster 3 had 26 respondents from the faculty of Informatics and Design, Cluster 4 had 20 respondents from the Applied Sciences faculty and Cluster 6 had 30 respondents from the Health and Wellness Sciences faculty. Clusters 8 and 11 enrolled 23 respondents respectively from both the Health and Wellness and Applied Sciences faculties on the Bellville Campus. Cluster 2 had 35 respondents from the faculty of Education on the Mowbray campus, subsequent to obtaining HOD permission.

Clusters 7 and 9 were recruited using a modified quota sampling strategy (Bryman, 2012) as described previously, when the researcher identified that additional participants would be needed to represent the Business faculty as a result of the inability of the HOD to facilitate the survey administration. The survey was conducted at the faculty of Business student commons. Clusters 7 and 9 included 35 and 62 participants respectively, with Cluster 7 enrolling 32 participants and cluster 9, 34 from the Business faculty. The remainder of participants were students from faculties across the Cape Town campus, including Engineering, Applied Sciences and Informatics and Design. The result of this sampling strategy was a largely overrepresented sample from the Cape Town campus.

The researcher then identified the need to conduct similar sampling strategies, as described, on the Mowbray and Bellville campuses. This resulted in Cluster 5 from Mowbray campus contributing 25 additional campus and Education faculty participants to the study. Clusters 10 and 12 recruited an additional 60 and 26 participants from all faculties on the Bellville campus.

Towards the end of the data collection period, it was noted that the faculty of Informatics and Design was underrepresented, and this was remedied by a survey-distribution activity targeting the Design student commons and computer laboratories. This exercise recruited 16 participants from the faculty of Informatics and Design, with an additional 11 participants being from the Business faculty.

A total of 13 clusters was therefore included in the final sample. The Data Inventory is available on request.

b) QUAL sample

Only wearers who provided their contact details and agreed to the interview invitation were included. Both telephonic and electronic means of communication were employed to recruit wearers to the interviews. Only eight wearers were finally recruited into the QUAL strand of the study.

3.6.2 Administration of the questionnaire

The surveys were distributed by the researcher over a period of 4 weeks during the fourth term of 2014. This period also coincided with the festivities relating to Halloween, which the researcher deemed to be significant to the timing of the study (Charm, et al., 2010).

Departmental student clusters, as previously described, were provided with the questionnaire and informed of their right to refuse participation. In order to ensure the highest rate of questionnaire return, the researcher remained in the survey venue until the surveys were completed. The survey administration time did not exceed 15 minutes, and the surveys were personally collected by the researcher.

For the student commons sampling, the researcher approached potential participants individually to enquire whether they were undergraduate full-time students. Students were then informed about the study and invited to complete the self-administered survey. Students who consented to completing the survey were given sufficient time to complete it. The researcher remained in the student commons area until the surveys were completed and personally collected the surveys.

A total of 420 surveys were collected during the QUAN phase of the study.

3.6.3 Interviews

For the QUAL strand of this study, interviews were conducted with those respondents who indicated that they had practical CCL wearing experience (n=28), and who had agreed to an interview during the QUAN phase. The interview was conducted over the WhatsApp IM platform, as all interviewees, after

being provided with an opportunity to meet for a face-to-face interview, indicated that this was the most convenient way for them to conduct the interview.

This sample answered semi-structured interview questions, derived from the QUAN results.

Where the interview revealed any reason for concern regarding the interviewee's ocular health, the researcher referred the interviewee to a practitioner of their choice for a complete ocular health assessment.

The participants' responses to the interview were tracked and recorded by means of the IM discussion report. This provided an automatically transcribed and accurate reflection of the communication.

3.7 DATA MANAGEMENT

3.7.1 Data Handling

Surveys were captured into a Microsoft Excel spreadsheet. Each survey form was given a unique identifier, using the cluster number followed by the nominal value within the cluster.

To ensure data integrity, questionnaire responses were double entered by the researcher and an assistant as soon as a cluster was completed. All questionnaires were stored in clusters chronologically and numerically for purposes of audit.

Surveys were excluded from the sample if the respondents did not meet the age criterion of 18 – 35 years.

3.7.2 Data Analysis

Data were analysed in Microsoft Excel 2010, using descriptive statistics and cross-tabulated for association analyses using Microsoft Excel Pivot Tables. Pearson's Chi-square test for independence was employed and statistical significance was at 95%. Correlation analyses were conducted using bivariate analysis and Cronbachs Alpha test for construct validity to test correlation among the self-reported behaviour items in the questionnaire (Appendix B).

QUAL data were analysed by manually entering the communication transcripts (Appendix H) into a Microsoft Excel sheet and developing a QUAL inventory. Following this, a manual content analysis was conducted to identify and code the data which revealed consistencies, inconsistencies or surprising findings amongst the responses.

3.8 ETHICAL CONSIDERATIONS AND CONFIDENTIALITY

Permission was sought and obtained from the management of the Cape Peninsula University of Technology to conduct the study amongst its student population (Appendix D). This permission accompanied the applications to the Biomedical Research Ethics Committee of the University of KwaZulu-Natal and the Senate Ethics Committee of the Cape Peninsula University of Technology respectively; and approval to conduct this study was subsequently obtained (Appendices E and F).

All participants were dealt with in an impartial manner and no student was prejudiced in any way. All participants were informed of the procedure by the inclusion of the information sheet (Appendix A) and informed consent was obtained from each participant.

Each subject was informed that participation was voluntary and they were free to withdraw from the study if they so wished. Participants were assured that confidentiality of the data would be maintained and that none of the participants would be individually identified in the results.

All questionnaires and interview record sheets were stored in a locked cupboard for the duration of the study and would be retained for five years, after which they would be shredded. All electronic data captured from the questionnaires and interview record sheets was stored on a password-protected computer.

Information obtained from the results of the study was demonstrated to be beneficial to the student body, the greater South African public and the optometric and medical communities.

Any ocular health concerns identified during the study, resulted in the interviewee being referred to an eye care practitioner of their choosing for a complete ocular health assessment.

3.9 SUMMARY

Owing to the wide range of objectives guiding the study, and the many unknown factors relating to CCL procurement and usage, it was necessary to consider a mixed methods approach in gathering data to relating to this phenomenon.

The use of the WhatsApp IM platform proved to be a valuable method of accessing data from the wearer group.

CHAPTER 4: RESEARCH FINDINGS

4.1 INTRODUCTION

This study aimed to describe cosmetic contact lens (CCL) exposure, as well as the procurement and usage practices associated with CCLs amongst students attending a university in Cape Town, South Africa.

A total of 420 questionnaires were collected from participants as described in Chapter 3. Each questionnaire was given a unique identifier. Data were coded and captured into a Microsoft Excel 2013 spreadsheet, after which preliminary analyses were performed to test the data integrity. This resulted in a final number of 394 participants being considered, mainly due to the large sections of incomplete data as well as exclusion criteria.

The findings of the quantitative (QUAN) research survey were categorised according to: demographic data, eye care history and self-reported student behaviours for all participants. Data relating to CCL knowledge and attitudes toward CCL use and procurement were gathered from only those students who were aware of CCLs. A question relating to CCL exposure identified 28 wearers, of which 8 were interviewed during the subsequent qualitative (QUAL) phase of the study. The QUAL data was analysed using content analysis to identify themes related to personal experience and procurement practices in CCL wear which aimed to explain the QUAN findings.

This Chapter will present the primary research findings in a sequence that follows the 2-phase sequential data collection process. It aims to provide a comprehensive body of evidence to contribute towards each of the research objectives.

4.2 PARTICIPANT EXPOSURE TO COSMETIC CONTACT LENSES

The first objective of the study was to determine CCL exposure in the target population. As shown in Figure 4.1, 46.70% of participants (n=184) indicated that they had heard of CCLs, compared to 51.02% of participants (n=201) who indicated that they had "never heard of these lenses before". Nine participants failed to complete the question.

Figure 4.2: CCL Awareness of Participants

The term "CCL-aware" was used to describe those who had had any exposure to CCLs, with "CCL-unaware" referring those who had never heard of the subject. The CCL-aware category was further subdivided into "wearers" and "non-wearers".

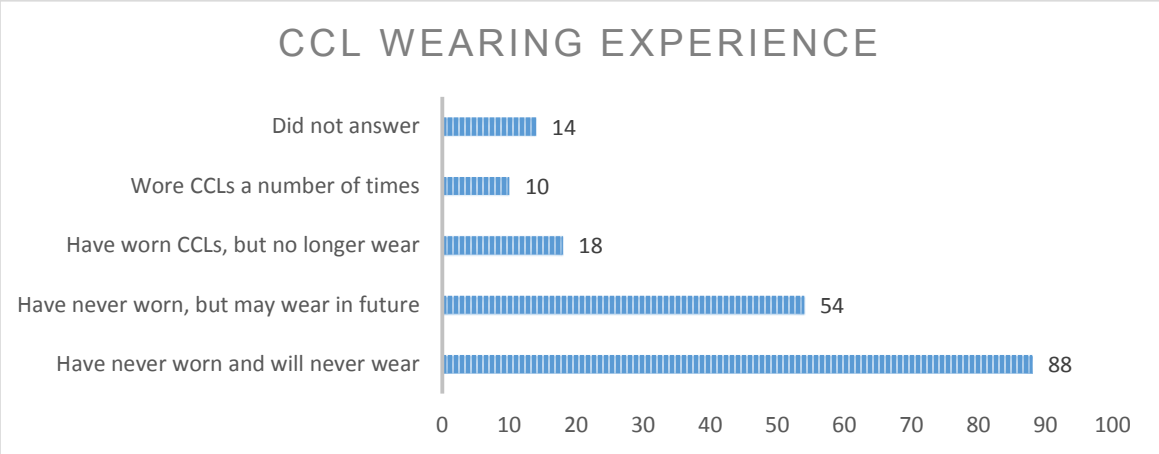

Figure 4.3: CCL Wearing Experience

As demonstrated in Figure 4.2, of the CCL-aware participants (n=184), 88 respondents (47.82%) indicated that they had never worn CCLs and would not

wear them in future. Fifty four participants (29.35%) indicated that that had never worn, but would consider wearing in future. These participants were grouped together as “non-wearers”.

Eighteen respondents (9.78%) had worn CCLs, but no longer wore them and 10 respondents (5.43%) had worn CCLs a number of times. The phrasing of this question did not require respondents to indicate whether they were current wearers or not. However, these participants were grouped together into the “wearer” group and the question of current or discontinued wear was pursued during the QUAL phase of the study. The resultant number of wearers identified for recruitment into the QUAL phase was 28 of 394 participants or 7.11%.

4.2.1 Demographic Data

In addressing CCL exposure, it was necessary to describe the demographic characteristics of the study sample and analyse CCL exposure against these characteristics.

a) Age of Participants

Questionnaire respondent’s ages ranged from 18 years to 46 years of age.

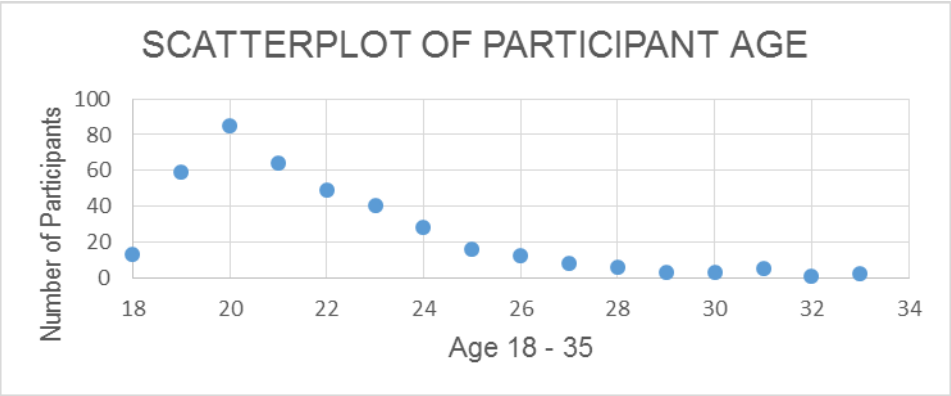

Figure 4.4: Age Distribution of Participants

Only those participants between 18 and 35 years of age were included in the study as per the protocol. The mean age was 21.8 ± 2.8 years (range from 18 – 33 years) with the mode of the age distribution at 20 years and the median at 21 years (Figure 4.3).

In order to conduct analyses by age, two age groups were created as indicated in Table 4.1. CCL awareness was cross-tabulated against age, and 28 participants were excluded owing to incomplete data.

Of the 366 participants included in the analysis, those in the 18 to 23 years category demonstrated a 44.44% CCL awareness (n=128). Nineteen wearers (14.84%) were identified in this group.

Participants from the older age group (24 years and older) showed a marginally higher CCL awareness at 50% (n=39). The remaining seven wearers were identified from this group (17.95%).

Pearson's Chi-square testing for independence could not reject the null hypothesis (p=0.6073), which suggested that the higher CCL wearing frequency among the older age group was of no statistical significance and could merely have been a chance finding.

Table 4.1: CCL Awareness by Age Group

AGE GROUP	NEVER HEARD OF CCLS	HAVE HEARD OF CCLS			GRAND TOTAL
		Non-wearers	Wearers	Subtotal	
18 to 23 years	160	109	19	128	288
24 years and older	39	32	7	39	78
Total	199	141	26	167	366

b) Gender

The gender distribution of participants, revealed a female majority of 56.01% (n=221) with 43.4 % (n=171) being male. This closely resembled the proportions of the CPUT gender profile. Two participants did not specify their gender, and were not included in further gender analyses.

Gender data were analysed to determine whether an association could be found with CCL awareness. The contingency table for CCL exposure by gender (Table 4.2) demonstrates the gender distribution against CCL-awareness. For male participants 38.46% were CCL-aware compared to 51.69% of female participants. In addition, 5.33% of males indicated that they had worn CCLs, compared to 8.21% of females.

When performing the Pearson's Chi-Square test for independence, an association was found (p= 0.0353) indicating that CCL exposure (including wearing exposure) was dependant on gender.

Table 4.2: Cross-tabulation of CCL Exposure and Gender Data

GENDER	NEVER HEARD OF CCLS	HAVE HEARD OF CCLS			GRAND TOTAL
		Non-wearers	Wearers	Subtotal	
Male	104	56	9	65	169
Female	100	90	17	107	207
Total	204	146	28	174	376

c) Campus distribution

The campus representation illustrated by Figure 4.4, included 54.56% of participants from Cape Town campus (n=215), 31.72% from Bellville campus (n=125) and 13.70% from Mowbray campus (n=54).

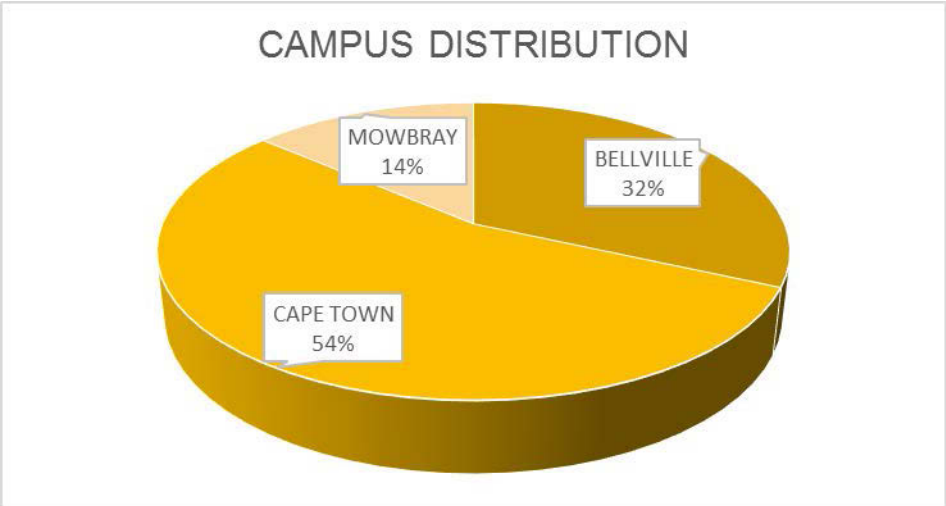

Figure 4.5: Campus Distribution of Participants

As demonstrated in Table 4.3, an association was found between campus representation and CCL awareness (p=0.0150). Cape Town campus contributed the highest number of CCL-aware participants to the study (n=105) and also had the highest proportion (51.72%). Bellville campus had 42.28% CCL-aware participants (n=52), whereas Mowbray revealed a significantly lower CCL-aware proportion of 31.48% (n=17). Fourteen participants failed to provide complete data in this regard and were excluded from the analysis.

Table 4.3: CCL Awareness by Campus

CAMPUS DISTRIBUTION	NEVER HEARD OF CCLS	HAVE HEARD OF CCLS			GRAND TOTAL
		Non-wearers	Wearers	Subtotal	
Bellville	71	48	4	52	123
Cape Town	98	86	19	105	203
Mowbray	37	12	5	17	54
Total	206	146	28	174	380

As the campuses presented a mixed and varied faculty distribution, further analysis was required to determine if the significance was somehow linked to faculty rather than campus.

Table 4.4: Faculty Distribution by Campus

FACULTIES BY CAMPUS	*CAPE TOWN*	*BELLVILLE*	*MOWBRAY*	*TOTALS*
Applied Sciences	24(0.35)	44(0.65)	0	68
Business	75(0.96)	3(0.04)	0	78
Education	0	0	54(1.0)	54
Engineering	28(0.36)	50(0.64)	0	78
Health and Wellness Sciences	30(0.54)	26(0.46)	0	56
Informatics and Design	53(1.0)	0	0	53
Totals	211	123	54	387

d) Faculty distribution of participants

All faculties were represented in the study sample (Table 4.4). Seventy eight participants included in this analysis were from courses within the Business faculty (20.16%), while an equal percentage were from the Engineering faculty (n=78), followed by the Applied Sciences Faculty at 17.6% (n=68). The relatively higher proportions of these faculties compared with the remaining three faculties, has been explained in the previous chapter. The Education faculty contributed 13.95% of participants (n=54) and Health and Wellness Sciences faculty contributed 14.47% (n=56). The faculty of Informatics and Design contributed 13.70% (n=53), of participants to the study. Seven participants were excluded from the analysis owing to incomplete data provided, and were not included in further faculty analyses.

Table 4.5: CCL Awareness and Faculty Distribution Data

CCL AWARENESS BY FACULTY	HAVE HEARD OF CCLS		HAVE NEVER HEARD OF CCLS		TOTALS
	Count	Standardized Score	Count	Standardized Score	
Applied Sciences	27(0.39)	-0.9532	42 (0.61)	0.8976	69
Business	40(0.53)	0.8004	35(0.47)	-0.7537	75
Education	16(0.30)	-1.7850	37(0.70)	1.6808	53
Engineering	24(0.32)	-1.8946	51(0.68)	1.7840	75
Health and Wellness Sciences	40(0.69)	2.4405	18(0.31)	-2.2980	58
Informatics and Design	33(0.62)	1.6212	20(0.38)	-1.5266	53
Totals	180	0.0000	203	0.0000	383

Table 4.5 provides a summary of the faculty distribution of CCL-aware participants. These data demonstrated statistical significance using the Pearson Chi-square test for independence ($p<0.0001$), and CCL awareness was found to be dependent on participants' faculty distribution. The analysis revealed that participants in the Applied Sciences, Education and Engineering faculties were less likely to be aware of CCLs than those in the Business, Health and Wellness

Sciences and Informatics and Design faculties. This finding was further analysed to determine the deviation from the mean by considering the standardised scores.

The faculties of Engineering and Education respectively, exhibited the largest negative deviation from the mean, followed by Applied Sciences, whose deviation was not as large, but still fell below the mean. This indicated a lower than average CCL awareness amongst participants from these faculties. The Health and Wellness Sciences faculty demonstrated the largest positive deviation from the mean, thus indicating a higher than average CCL awareness. This was followed by the Informatics and Design and Business faculties, who also demonstrated a positive deviation.

This observation suggested the possibility of faculty-specific variables that influenced CCL-awareness.

Table 4.6: CCL Awareness of Participants by Faculty Group

CCL AWARENESS	GROUPED FACULTY DISTRIBUTION		TOTAL
	Group 1	Group 2	
Have heard of CCLs	67 (0.34)	113 (0.61)	180
Have never heard of CCLs	130 (0.66)	73 (0.39)	203
Total	197	186	383

The distribution of CCL-aware participants in Group 1 was proportionally lower (34.01%) compared with that of Group 2 (60.75%). Worth noting too, is that the majority of faculty participants in the first group were from the Cape Town campus, whereas the participants from the second group were predominantly from the Bellville and Mowbray campuses.

e) Ethnic distribution of participants

The ethnicity profile of the sample (Figure 4.5) was closely related to the institutional profile, further validating the sampling strategy.

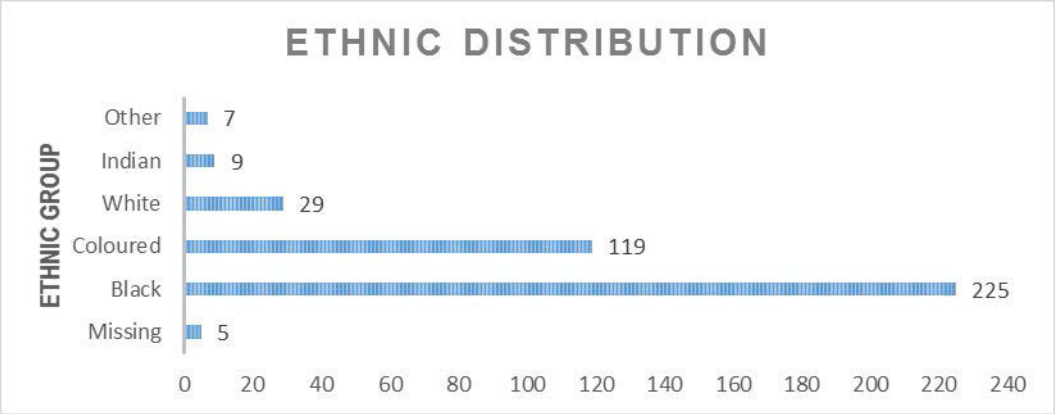

Figure 4.6: Ethnic Distribution of Participants

The largest proportion (56.96%) of participants identified themselves as Black (n=225), followed by 30.13% (n=119) identifying themselves as Coloured. 7.34% (n=29) were White, 2.27% were Indian (n=9) and another 1.77% (n=7) indicating other ethnic profiles, including African (n=1), Asian (n=2), Khoisan (n=1), Malay (n=2) and “not sure” (n=1).

Table 4.7: Faculty Group by Ethnicity

FACULTY GROUP BY ETHNICITY		Black	Coloured	Other	Total
Group 1	Applied Sciences	57(0.25)	8(0.07)	3(0.08)	68
	Education	27(0.12)	26(0.22)	1(0.03)	54
	Engineering	60(0.27)	17(0.14)	1(0.03)	78
	Group Total	144(0.72)	51(0.25)	5(0.02)	200
Group 2	Business	45(0.20)	26(0.22)	7(0.18)	78
	Health and Wellness Sciences	20(0.09)	19(0.16)	17(0.45)	56
	Informatics and Design	16(0.07)	22(0.19)	9(0.24)	47
	Group Total	81(0.45)	67(0.57)	33(0.18)	181
GRAND TOTAL		225	118	38	381

Analysis of the ethnic distribution by faculty group (Table 4.7) demonstrated the highest frequencies of Black ethnicity amongst the Applied Sciences and Engineering faculties (Group 1), with the lowest frequencies amongst the faculties of Health and Wellness Sciences and Informatics and Design (Group 2).

Coloured ethnicity had the highest frequency in the Education and Business faculties, with its lowest representation in the Applied Sciences faculty. "Other" ethnicity had its lowest frequencies amongst the three faculties in Group 1.

When performing the Pearson's Chi-Square test, CCL awareness was found to be significantly associated with ethnic distribution ($p<0.0001$), with the hypothesis of independence being totally rejected.

As observed in Table 4.8, amongst the Black ethnic category in the sample 51% (n=105) indicated CCL-awareness compared with 76% (n=87) amongst the Coloured ethnic category. The 'White', 'Asian' and 'Other' ethnic categories were combined due to their relatively small participant representation and revealed a 78% CCL-awareness proportion (n=35).

Table 4.8: CCL Awareness by Ethnic Distribution

ETHNIC GROUP	NEVER HEARD OF CCLS	HAVE HEARD OF CCLS			GRAND TOTAL
		Non-wearers	Wearers	Subtotal	
Black	101(0.49)	59	9	105(0.51)	206
Coloured	28(0.24)	57	13	87(0.76)	115
Other	10(0.22)	25	4	35(0.78)	45
Total	199	141	26	167	366

Analysis of the data established that CCL-awareness is lowest amongst participants of Black ethnicity, and in fact only nine wearers were revealed from this sample group (4.37%). The wearer proportion from the group indicating Coloured ethnicity was considerably higher with 13 wearers at 11.30%, followed by the wearer proportion for "Other" at 8.89% (n=4). The data suggests that interrelated socioeconomic factors may be present, which will be expounded during the discussion in Chapter 5.

f) Self-reported financial status of participants

Data relating to the self-reported financial status of participants as demonstrated in Table 4.9 revealed that 58.89% of participants (n=212) were able to "afford basic items, but not luxury goods"; and 20.27% (n=73) were able to "afford luxury goods and extra things". Only 20.83% of students surveyed (n=75) indicated that they "struggle to afford basic items such as food and clothing". 14 participants were excluded from the analysis due to incomplete data.

As expected, a statistically significant association ($p<0.0001$) was found between financial status and CCL wear, with only 23% of those participants who selected "struggle to afford basic items such as food and clothing" demonstrating CCL awareness.

In contrast, 62% of those participants who specified "afford luxury goods and extra things" indicated that they had heard of CCLs. CCL awareness was at 49% for those who indicated they could "afford basic items, but not luxury goods".

Table 4.9: CCL Awareness by Financial Status

SELF-REPORTED FINANCIAL STATUS	NEVER HEARD OF CCLS	HAVE HEARD OF CCLS			TOTAL
		Non-wearers	Wearers	Subtotal	
I struggle to afford basic items such as food and clothing	58(0.77)	15	2	17(0.23)	75
I can afford basic items, but not luxury goods.	109(0.51)	90	13	103(0.49)	212
I can afford luxury goods and extra things.	28(0.38)	34	11	45(0.62)	73
Total	195	139	26	165	360

With regard to CCL wear by financial status, only two wearers originated from the "struggle to afford basic items such as food and clothing" group (2.7%) compared to 11 wearers from the "afford luxury goods and extra things" group (15.07%). Thirteen wearers were found amongst the participants who indicated they were "able to afford basic items, but not luxury goods" (6.13%). Financial status was therefore a significant predictive factor in CCL wear for the study population.

Another test for independence was conducted to determine whether financial status and ethnicity were associated. The association was decidedly significant

(p<0.0001). The data displayed in Table 4.10 indicated that Black ethnicity had a proportionally higher frequency in the "struggle to afford basic items such as food and clothing" category, where 30.49% of participants from the Black ethnic category selected this status, compared with 8.62% of those from the Coloured ethnic category and 2.63% from the combined ethnicity category ("Other"). Similarly, a lower proportional frequency (10.76%) was observed in the "afford luxury goods and extra things" category amongst participants from the Black ethnic group, compared with 34.48% and 34.21% frequencies for Coloured and "Other" ethnic groups respectively. This data offers further evidence of socioeconomic factors that may be associated with CCL awareness.

Table 4.10: Financial Status by Ethnicity

SELF-REPORTED FINANCIAL STATUS	BLACK	COLOURED	OTHER	TOTAL
I struggle to afford basic items such as food and clothing	68(0.35)	10(0.09)	1(0.03)	79
I can afford most of the basic items, but not luxury goods.	131(0.59)	66(0.57)	24(0.63)	221
I can afford luxury goods and extra things.	24(0.11)	40(0.34)	13(0.34)	77
Total	223(0.59)	116(0.31)	38(0.10)	377

g) Eye colour distribution

The question on eye colour was an open text field, to allow for participants' own description of this variable. Five categories were then created: dark brown, brown, hazel, green and blue. Where participants indicated more than one colour, the researcher selected the first colour e.g. hazel-brown became hazel. Where participants used descriptive words and unusual colours, the researcher interpreted the description and selected the closest colour category e.g. light brown or gold-brown became "hazel". Black was categorized as "dark brown".

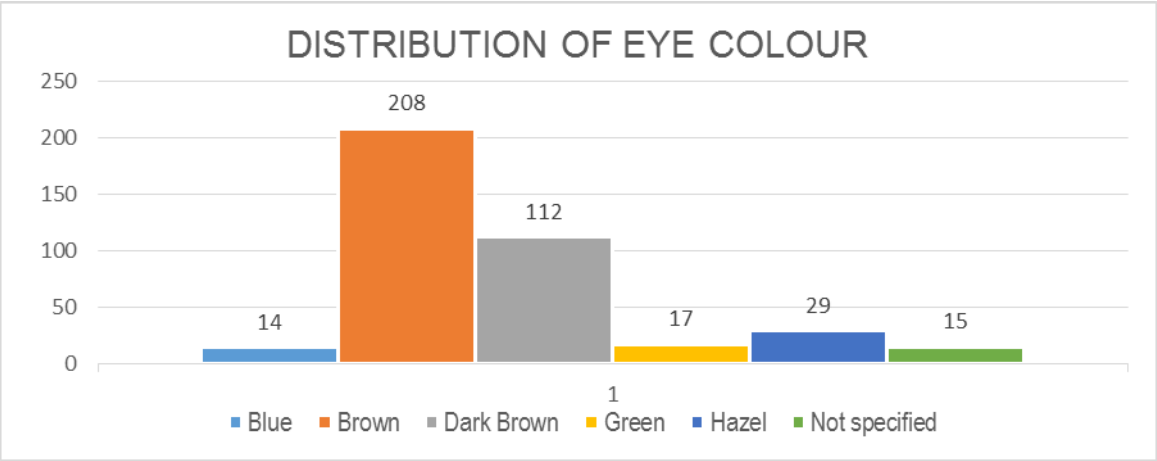

Figure 4.7: Frequency Distribution of Eye Colour

Of the 394 participants, 52.79% (n=208) indicated that they had brown eyes, 28.43% (n=112) described their eyes as dark brown or black, and 7.36% (n=29) provided the description of hazel eye colour. 4.31% described their eye colour as green (n=17) and 3.55% (n=14) indicated that they had blue eyes. 15 participants did not specify their eye colour.

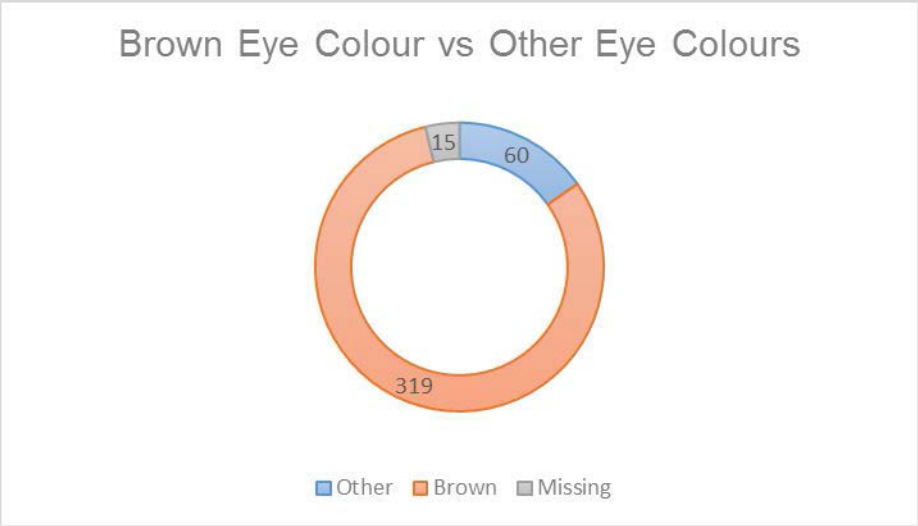

Figure 4.8: Brown Eye Colour vs Other Eye Colours

When considering these data by brown eye colour versus other eye colours, the study sample exhibited a distribution of 80.96% of participants with brown eye colour (n=319) compared to 15.23% with other eye colours (n=60). Eye colour was found to be associated with CCL awareness but with only marginal statistical significance (p=0.049).

h) Place of Origin

The question relating to home province/ place of origin was answered in 367 of the included data, with 27 participants not completing this question.

Thirteen participants of the 367 (3.53%) indicated "South Africa", rather than a specific province as their place of origin, whilst Australia and France were indicated as place of origin by two students. 44.02% of participants were from the Western Cape (n=162) and 31.99% were from the Eastern Cape (n=106). Gauteng and KwaZulu-Natal had 3.26% representation each in the sample, with these two provinces being listed by 12 students each.

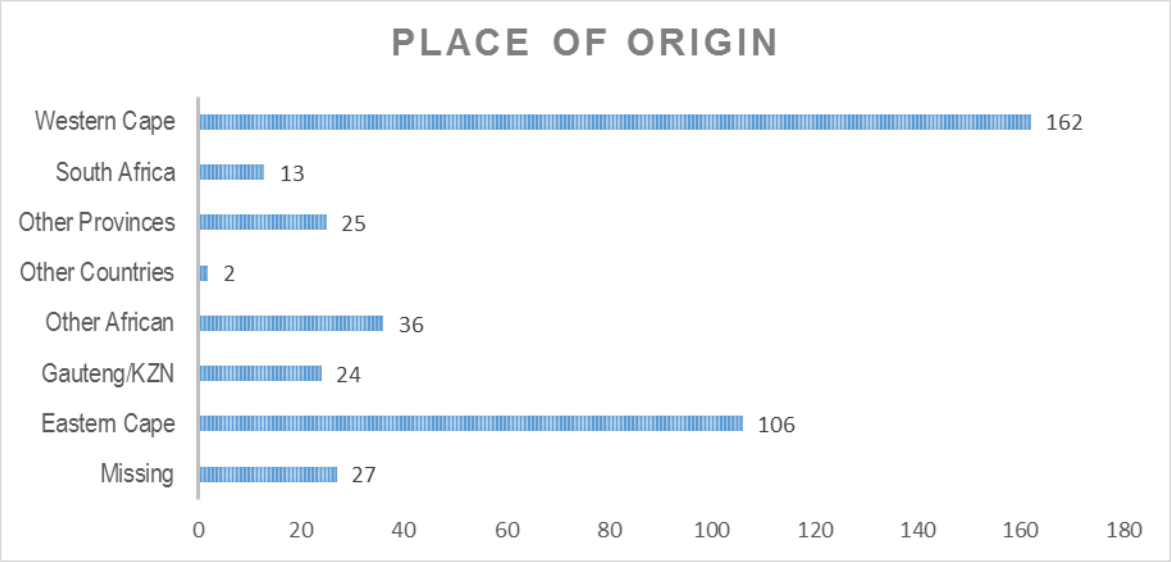

Figure 4.9: Frequency Distribution of "Place of Origin"

The remaining South African respondents indicated their provincial origins as follows: 2.44% (n=9) indicated that they were from Limpopo Province, 2.02% (n=7) from Northern Cape, 1.15% (n=4) from Mpumalanga, (0.86%) from North West Province (n=3) and 0.58% (n=2) were from the Free State. These provinces were combined for reporting purposes into the category of "Other Provinces" with a 6.79% (n=25) contribution to the place of origin responses. 10.66% (n=36) were from neighbouring African countries, with DRC contributing the highest number of participants in this category (n=14).

Table 4.11: CCL Awareness by Place of Origin

PLACE OF ORIGIN	HAVE HEARD OF CCLS	NEVER HEARD OF CCLS	TOTAL
Eastern Cape	44(46.36%)	53(54.64%)	97
Other Countries	18(51.43%)	17(48.57%)	35
Other Provinces	33(57.89%)	24(42.11%)	57
Western Cape	122(77.21%)	36(22.78%)	158
Total	217	130	347

When considering CCL awareness by place of origin, 46.36% of participants from the Eastern Cape indicated that they had heard of CCLs. 51.43% of participants from the "Other Countries" origin category were CCL-aware, whilst 57.89% of the "Other Provinces" category had heard of CCLs. The majority of CCL-aware participants were from the Western Cape, with 77.21% of participants from this category stating that they had heard of CCLs. The test for independence of CCL-awareness against place of origin demonstrated that these two categories were significantly associated ($p<0.0001$). This suggested that participants from the Eastern Cape were least likely to have heard of CCLs whereas those from the Western Cape were most likely. However, based on the ethnic distribution by place of origin (Figure 4.9), it is evident that a mixing of the variables has been observed.

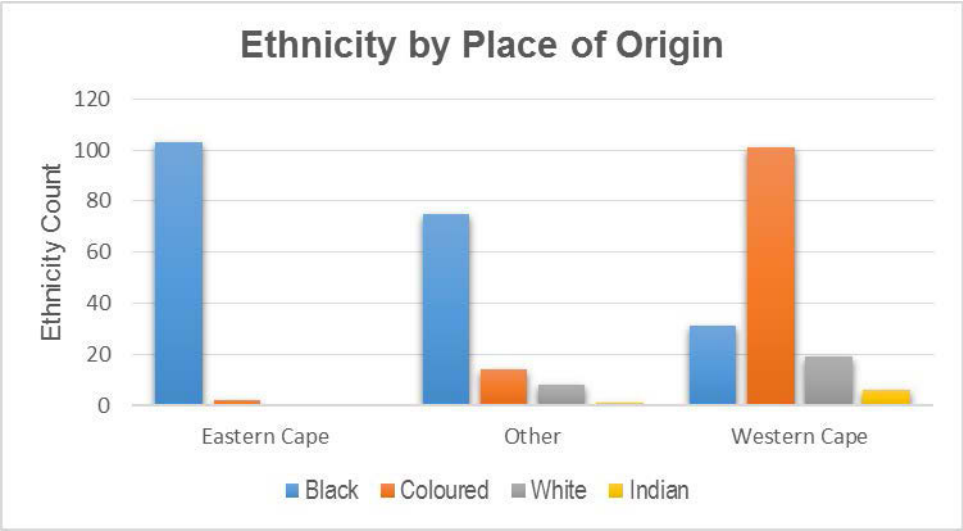

Figure 4.10: Ethnicity by Place of Origin

Participants from other countries as well as other South African provinces had a high CCL-unaware proportion, exceeding 40%. Indeed, the results demonstrated that 71.43% of wearers (n=20) were from the Western Cape, with 14.29% from the Eastern Cape (n=4) and the remaining 14.29% from other provinces (n=2) and neighbouring countries (n=2) combined.

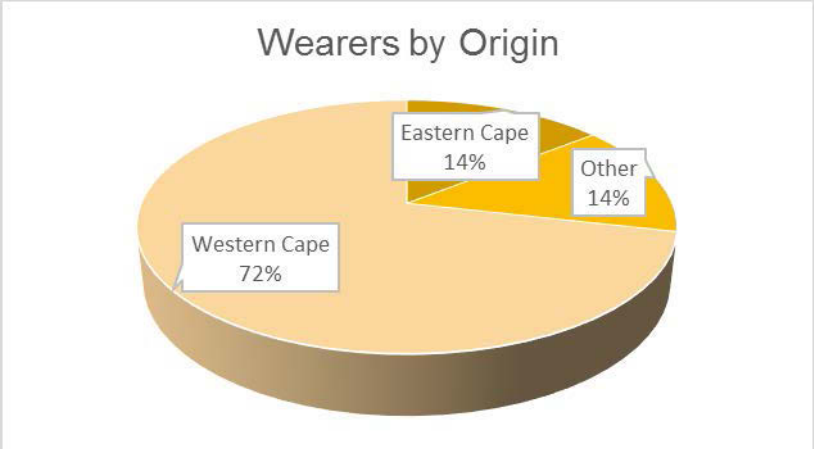

Figure 4.11: CCL Wearers by Place of Origin

i) Geographic Location

On the question of their residential area within Cape Town, the participants' responses were categorized according to the City of Cape Town's metropolitan zones (Figure 4.11).

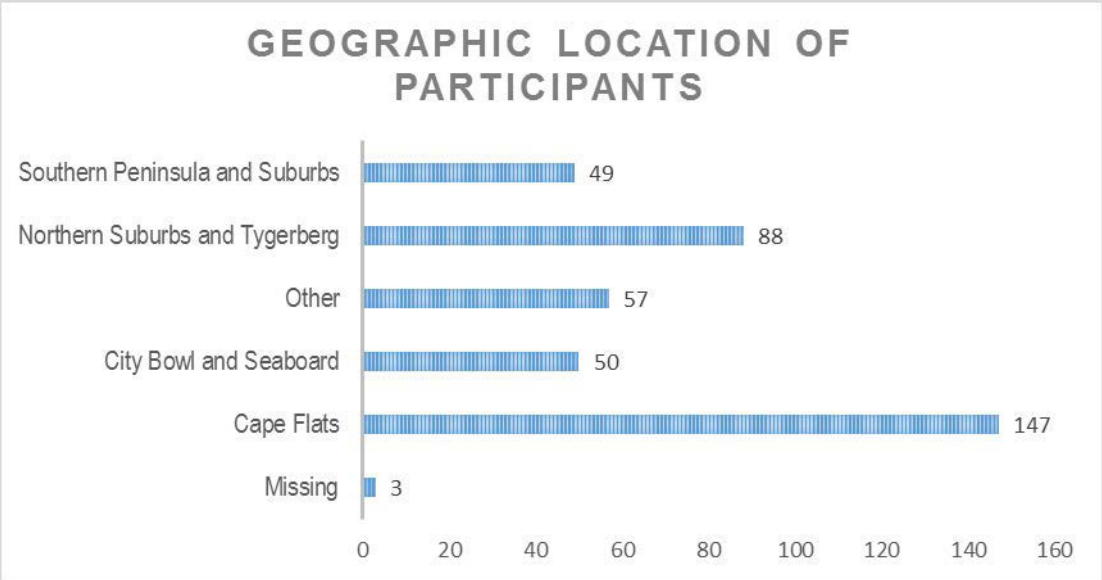

Figure 4.12: Frequency Distribution of Geographic Location

Fifty of the 394 participants, (12.69%) were from the City Bowl and Atlantic Seaboard, which, for the purposes of this study, included Woodstock, Salt River and Maitland. The Cape Flats region, which included many of the informal residential areas as well as the more established apartheid-era townships extending from Retreat in the South and Athlone in the West, to its Northern extent just outside the Tygerberg area; was home to 37.31% of the participants (n=147). The Northern Suburbs, including the Tygerberg area, was home to 22.33% of the participants (n=88) with the Southern Peninsula, including the Southern Suburbs being identified as the residential area of 12.44% of participants (n=49). A category combining participants residing in the outlying areas ("Other") including the Western Seaboard, Eastern Metropolitan area, Boland and Overberg regions comprised the remaining 14.47% (n=57).

Table 4.12: CCL Awareness by Geographic Location

GEOGRAPHIC LOCATION	HAVE HEARD OF CCLS	NEVER HEARD OF CCLS	TOTAL
Cape Flats	55(0.40)	81(0.60)	136
City Bowl And Seaboard	25(0.51)	24(0.49)	49
Northern Suburbs And Tygerberg	42(0.5)	42(0.50)	84
Other	32(0.59)	22(0.41)	54
Southern Peninsula And Suburbs	18(0.39)	28(0.61)	46
TOTAL	172	197	369

For purposes of analysis, five geographic categories were created as shown in Table 4.12.

The Southern Suburbs demonstrated the lowest frequency of CCL-awareness (39.13%), with only one wearer residing in the area. Although the Cape Flats region had 40.44% CCL-awareness, 13 wearers (46.42%) lived in this area. The Northern Suburbs region showed an equal (50%) distribution of CCL aware and unaware participants, and was home to eight wearers (28.57%). The City Bowl region demonstrated a marginally positive distribution for CCL-awareness (51.02%) with three wearers (10.71%) residing in the area. The outlying areas

("Other") demonstrated the highest frequency of CCL-awareness (59.26%) and also contributed three wearers (10.71%) to the study. With Chi-square analysis to test geographic location against CCL awareness, the categories of data were found to be independent (p=0.1182), implying that geographic location could not be used to predict CCL awareness.

4.2.2 Eye Care History of Participants

a) Last Eye Examination

As demonstrated in Figure 4.12, 44.16% of the 394 participants (n=174), reported having had an eye examination within the preceding two years, while 14.72% (n=58) reported having had their last eye test more than two years prior to the survey. Fifty two participants (13.2%) indicated that they could not remember when their eyes were last tested and 26.90% of participants (n=106) reported that they had never had an eye examination.

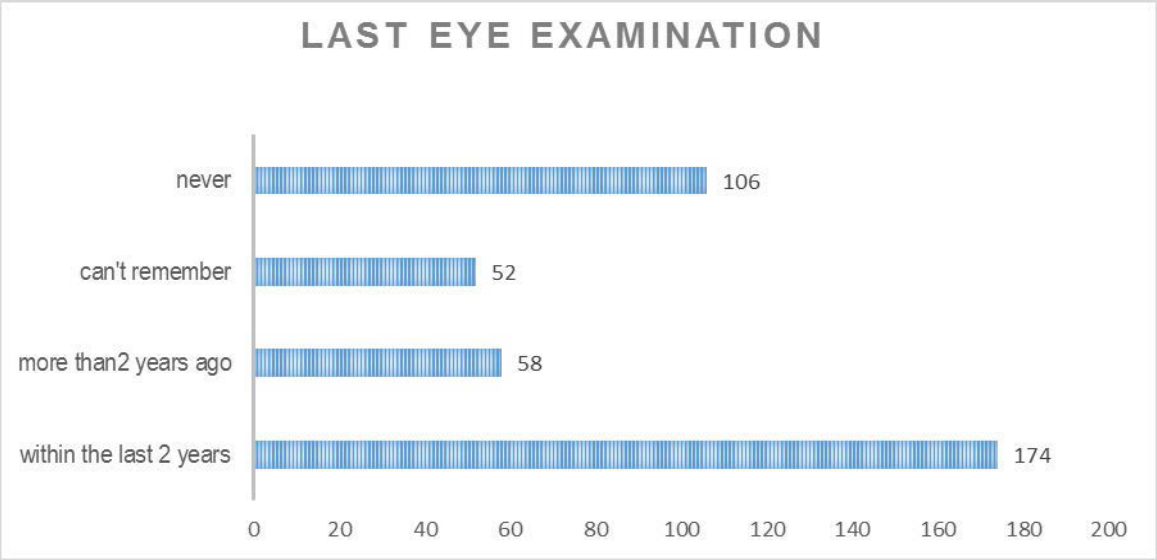

Figure 4.13: Frequency Distribution of "Last Eye Examination"

The categories “Last Eye Examination” and CCL awareness were found to be significantly associated (p<0.0001) using the Chi square test. The most significant finding (Table 4.13) was that 57.71% of CCL-aware participants (n=101) had undergone an eye examination within the 2 years preceding the study. Only 26.47% (n=27) of those who indicated that they had never had an eye exam were CCL-aware.

Table 4.13: CCL Awareness by Last Eye Examination

LAST EYE EXAMINATION	NEVER HEARD OF CCLS	HAVE HEARD OF CCLS		TOTAL
		Non-wearers	Wearers	
Within last 2 years	60(37.27%)	85(52.79%)	16(9.94%)	161
More than 2 years ago	26(48.15%)	24(44.44%)	4(7.41%)	54
Can't remember	32(62.75%	15(29.41%)	4(7.84%)	51
Never had an eye exam	75(73.53%)	25(24.51%)	2(1.96%)	102
Total	193	149	26	368

Of the 26 wearers included in this analysis, 16 indicated that they had recent eye examinations, compared with eight wearers who had not had a recent eye examination and only two wearers who never had an eye examination.
However, the test for row-column independence found no statistical significance (p=0.5264) and thus no association could be implied between these findings.

b) Vision Correction Worn

Participants were requested to select all modes of vision correction that applied to them. As shown in Figure 4.13, 55.58% of the entire study sample indicated that they were not wearing wear any vision correction (n=219).
Of the remaining participants, 33.5% (n=132) indicated that they wore spectacles and of these, 13 noted that they wore soft contact lenses. Data pertaining to these 13 participants were included in both the spectacle wearers and contact lens wearer categories for analysis. The study data summarised in Figure 4.13

revealed that 5.84% of the population sampled were soft contact lens wearers (n=23), with 1.27% (n=5) indicating that they wore hard contact lenses.

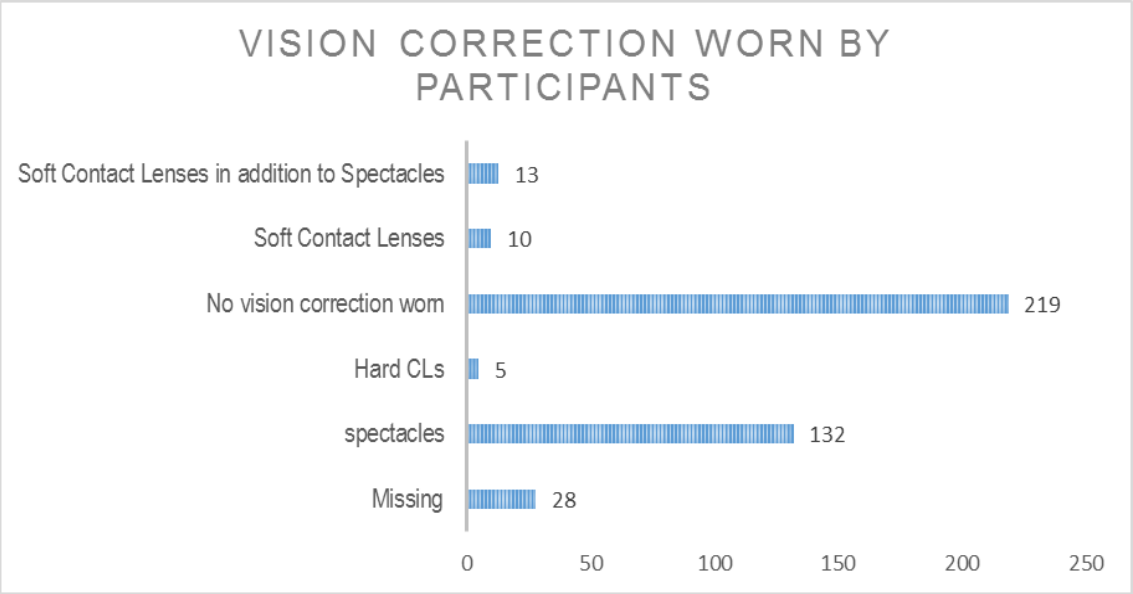

Figure 4.14: Vision Correction Worn by Participants

None of the participants reported having had laser refractive surgery. Twenty eight participants (7.1%) failed to answer the question.

When the categories of vision correction and CCL awareness were cross-tabulated (Table 4.14), 42 participants were excluded owing to incomplete row-column data, thus 352 participants were included in this analysis.

Table 4.14: Vision Correction by CCL Awareness

VISION CORRECTION	NEVER HEARD OF CCLS	HAVE HEARD OF CCLS			GRAND TOTAL
		Non-wearers	Wearers	Subtotal	
Spectacles	46(0.38)	63	11	74(0.62)	120
None worn	128(0.62)	66	11	77(0.38)	205
CLs	13(0.48)	6	8	14(0.52)	27
(CLs and spectacles)	*5(0.38)	*4	*4	*8(0.62)	*13
Grand Total	187	135	30	165	352

One hundred and twenty spectacle wearers were identified with a 62% CCL-aware proportion (n=74), of which 14.86% (n=11) indicated that they had worn CCLs. Inversely, for those participants who did not wear any correction (n=205), only 38% were CCL-aware (n=77) but of these, a similar proportion (14.28%) of wearers were found.

Participants identified as contact lens wearers (n=27), whether rigid or soft, showed a marginal CCL-awareness of 52% (n=14) but from this group, 57.14% indicated that they were CCL wearers (n=8).

The Pearson's Chi-square test for row-column independence was performed on the vision correction category against general CCL-awareness (aware compared with unaware) as well as for vision correction by wearing experience (wearers compared with non-wearers).
In both instances the test showed that a significant association ($p<0.001$) existed between these categories. This suggests firstly, that a higher likelihood of CCL awareness existed amongst wearers of vision correction than non-wearers; and secondly, that contact lens wearers in the study population who were CCL-aware, were more likely to wear CCLs than those who were spectacle wearers, or those who were non-wearers of vision correction.

4.3 SELF-REPORTED BEHAVIOUR CHARACTERISTICS

In order to gain an understanding of student behaviours, participants were asked to select the five statements which described them best. 69.37% of participants complied with the request, whilst 29.23% selected less than five- and 1.41% of participants selected more than 5 characteristics.

As demonstrated in Figure 4.14, the characteristic statement most commonly selected by 305 participants was “I am generally satisfied with my natural appearance”. The least-selected statement was “I generally follow what my friends do to be part of the crowd”, selected by only 29 participants.

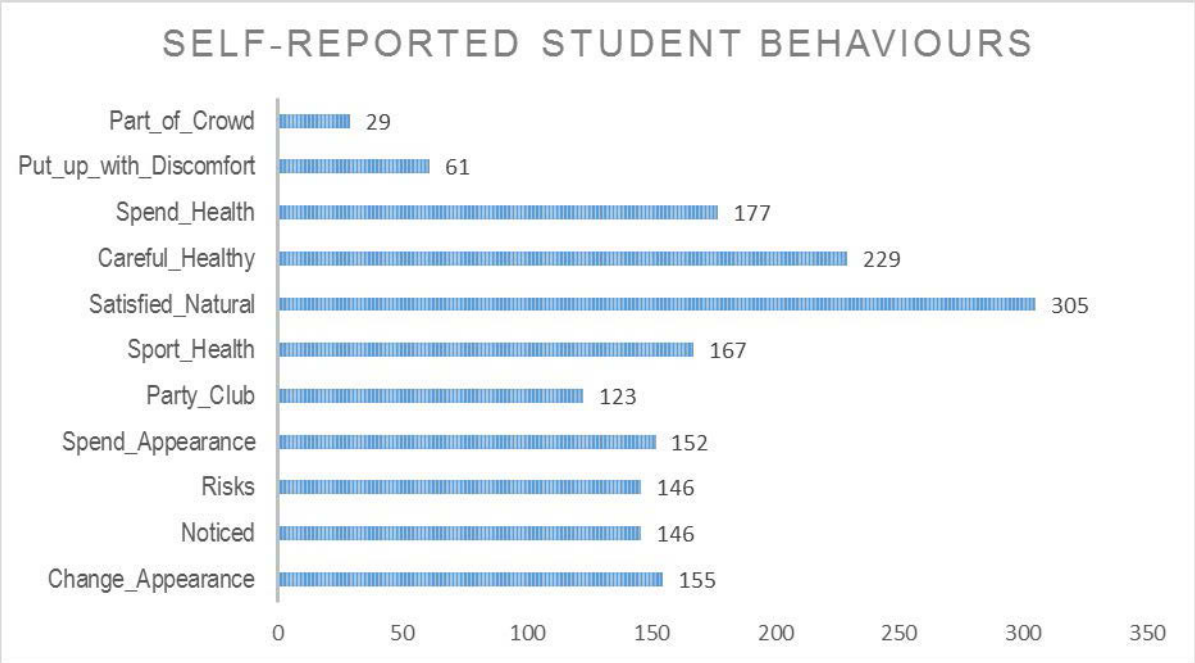

Figure 4.15: Self-reported Behaviours

Four scoring categories were created, to demonstrate whether participants had a tendency to select either of the following behaviours: vanity, health, social and risk. These scores were designed to count all responses where participants selected the specific behaviours which then contributed towards a weighted score. For instance, if a participant selected none of the behaviour statements included in a scoring category, they would receive ‘0’ for that category. If they however, selected all statements in a scoring category, they would receive the maximum score. The scores were then evaluated as to whether the participant had a low (0), medium or high (maximum score) affinity for that behaviour.

4.3.1 Vanity Behaviours

There were four vanity-related statements. 155 participants selected the statement: “I regularly change my appearance”. 152 participants selected “I spend money on my appearance”. As previously indicated, “I am generally satisfied with my natural appearance” was the most- commonly selected statement with 305 participants identifying with this statement. This statement was however not included in the ‘Vanity’ score calculation. The statement “I will put up with discomfort if it means I will look good” was also included in the scoring, with 61 participants identifying with this statement. The researcher decided to include the statement “I like to be noticed by those around me”, which was selected by 149 participants, in both the “Vanity” and ‘Social’ scores.

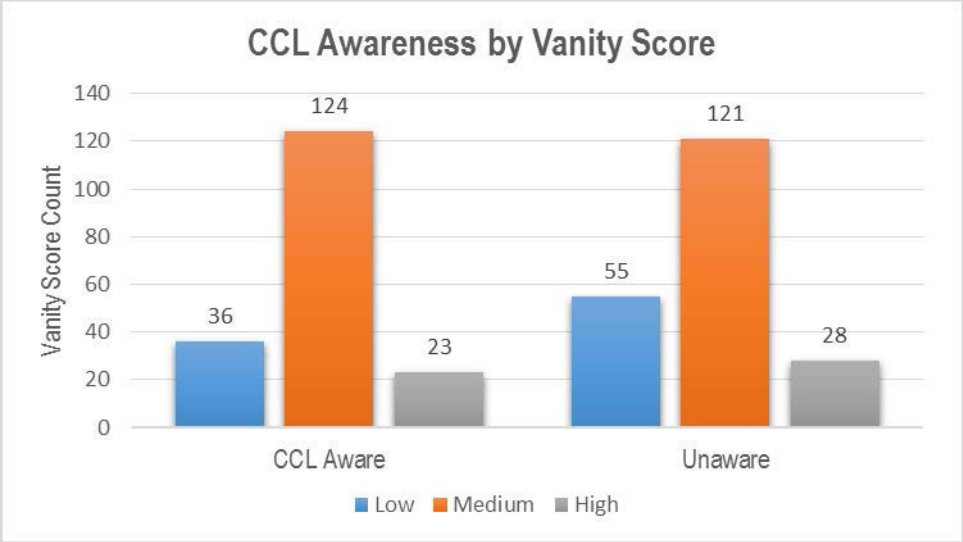

Figure 4.16: CCL Awareness by Vanity Score

The Vanity score ranged from ‘0’ to ‘4’, with ‘0’ being low and ‘4’ being high. 13.2% of participants (n=51) selected at least three of the four vanity-related statements demonstrating a high affinity for attention to their appearance. 63.3% of participants (245) selected one or two of the four statements, indicating a medium tendency toward considering their appearance. 23.5% of participants (n=91) did not select any of the vanity-related statements. Figure 4.15 illustrates the differences observed in CCL-aware versus unaware groups.

The question arose whether Vanity score was associated with CCL awareness. The Chi-square test did not demonstrate an association (p=0.1860). However, an

association was found between Vanity score and wearing experience (p=0.0027), with only 3.6% of wearers (n=1) compared with 23.9% of non-wearers demonstrating a low score (Table 4.15). A high score was obtained for 17.9% of wearers (n=5) as opposed to 11.3% of non-wearers (n=16) indicating that wearers demonstrated a higher affinity for their appearance.

Table 4.15: CCL Wearing Experience by Vanity Score

CCL WEARING EXPERIENCE	LOW	MEDIUM	HIGH	TOTAL
Non-wearers	34	92	16	142
Wearers	1	22	5	28
Total	35	114	21	170

4.3.2 Health Behaviours

With respect to the health-focussed statements; “I am careful about keeping healthy” was selected by 229 participants, followed by “I spend money on my health” which was selected by 177 participants and “I am frequently involved in sport/ health activities” which was selected by 167 participants.

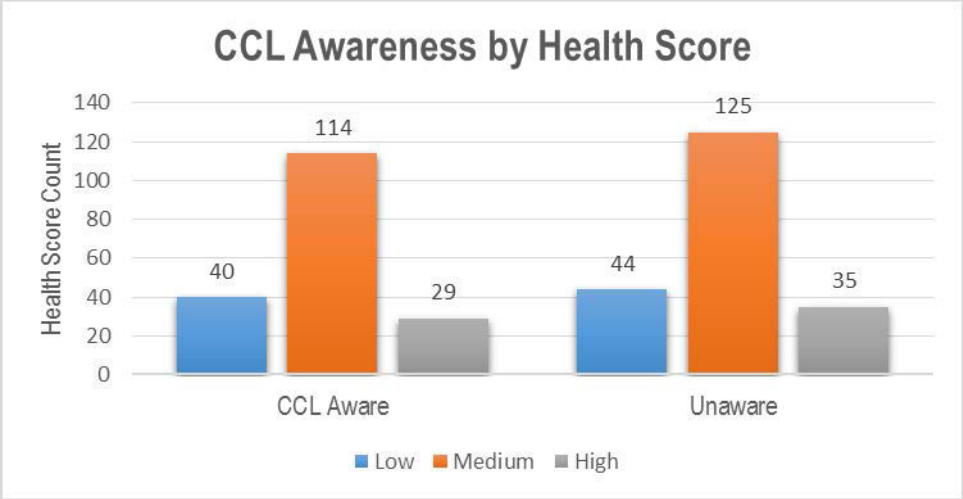

Figure 4.17: CCL Awareness by Health Score

The Health score had a minimum of ‘0’ and a maximum of ‘3’, as there were three health-related statements included in the analysis. 16.5% of participants (n=64) selected all of the health-related statements, while 61.8% (n=239) selected at least

one of the three. A low Health score was found for 21.9% of participants (n=84) who did not select any of the health-related statements. The relatively high proportion of participants selecting health-related statements may indicate a trend towards healthy choices amongst students.

No association was found between CCL awareness and health behaviours (p=0.9417), as the distribution of Health scores were nearly identical for CCL-aware and unaware groups as illustrated in Figure 4.16.

4.3.3 Social Behaviours

When considering the social interaction statements, "I like to be noticed by those around me" was selected by 149 participants and "I frequently attend parties/ clubs" was selected by 126 participants. "I generally follow what my friends do to be part of the crowd" was selected by only 30 participants, as previously described. The researcher decided to include "I am frequently involved in sport/ health activities", which was selected by 167 participants, in the social behaviour score.

Four social behaviour statements were therefore included in the Social score calculation. Only 28 participants selected three or four statements (High), with 104 selecting two of the four (Medium). The majority of participants (n=255) either did not select social behaviour statements or selected only one (Low). This distribution demonstrated a surprising finding of a low tendency of the sample to engage in social activities.

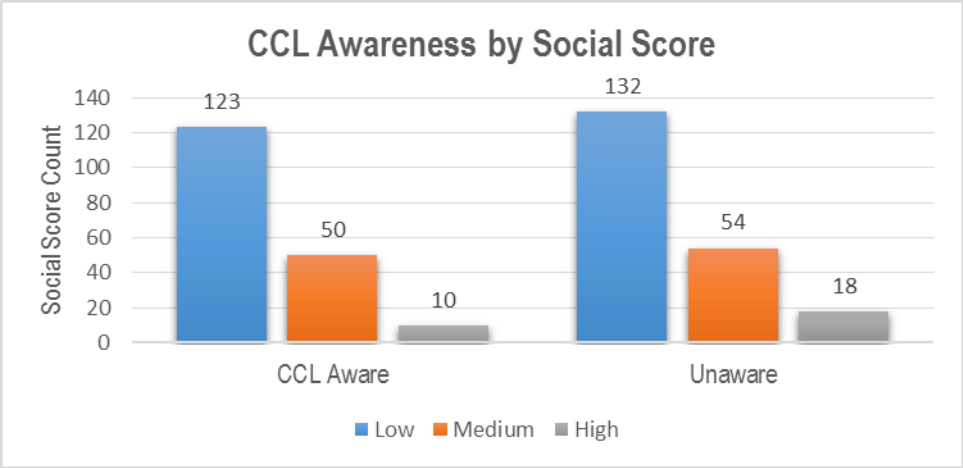

Figure 4.18: CCL Awareness by Social Score

No association was found between CCL awareness and social behaviours (p=0.4443), as demonstrated by the distribution as illustrated in Figure 4.17.

4.3.4 Risk Behaviours

The statement: “I sometimes take risks without considering my safety” was selected by 148 participants. The statements “I will put up with discomfort if it means I will look good” and “I generally follow what my friends do to be part of the crowd” were also included in the Risk score calculation, as the researcher considered these to imply potentially hazardous behaviours.

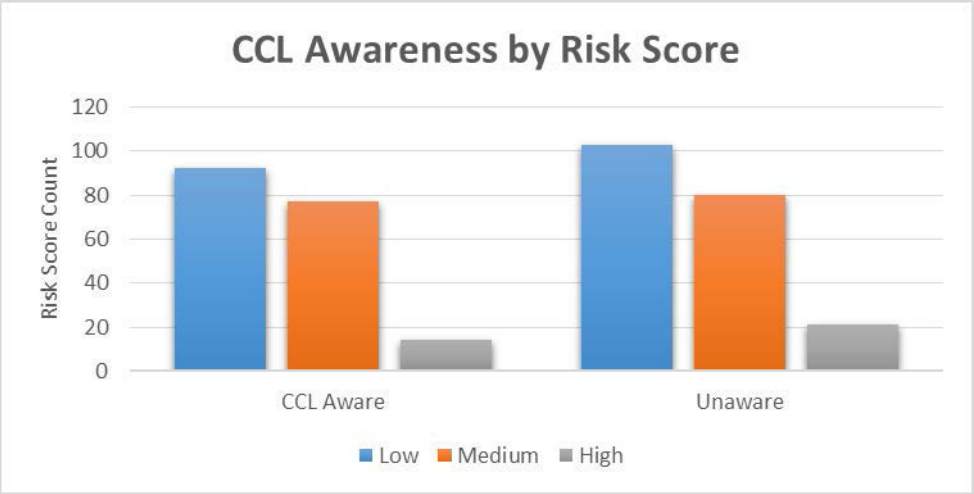

Figure 4.19 CCL Awareness by Risk Score

Only 35 participants (9%) demonstrated a high Risk score. The majority of participants (50.4%) did not select a single risk statement (n=195), while 40.6% (n=157) only selected one of the risk-related statements. This distribution demonstrated that the student population sampled had an aversion to risk-related behaviours.

No association was found between CCL Awareness and Risk score (p=0.6247).

Table 4.16: CCL Wearing Experience by Risk Score

CCL WEARING EXPERIENCE	LOW	MEDIUM	HIGH	TOTAL
Non-wearer	68	61	13	142
Wearer	17	11	0	28
Total	85	72	13	170

Although no association was found between wearing experience and risk behaviours (p=0.1820), it is noteworthy that 60.7% of wearers (n=17) did not select a single risk-related statement (Table 4.16).

4.4 ATTITUDES AND PRACTICES TOWARDS COSMETIC CONTACT LENS USAGE

Data relating to usage of CCLs was collected from CCL-aware participants (n=184) relative to a scenario, suggesting that the participant had obtained a pair of monthly disposable lenses. Participants were instructed to indicate their response to each statement relative to the scenario. Complete data was obtained from only 89% of the CCL-aware participants (n=164).

Thirteen statements were presented in an attempt to gather data on participant attitudes relating to the use of CCLs. Ten statements demonstrated negative CCL usage, and two statements demonstrated positive usage.

The data were analysed by conducting correlation tests across two main constructs: firstly, participant attitudes towards CCL safety risk relating to their physical properties; and secondly, participant attitudes towards hygienic CCL wearing behaviours. There were overlapping areas in each of these constructs.

As the focus of the response was the scenario, and not necessarily actual experience, the data was broadly referred to as “Attitudes” and not “Knowledge” or “Practice”.

4.4.1 Safety Risk Relative to CCL Physical Properties

Eight statements, as summarised in Table 4.17 constituted this subsection of the questionnaire, which tested participant attitudes regarding themes of risk relative to CCL physical properties.

The statements were compared and tested for correlation and statistical significance. However, Cronbach’s alpha for this group of statements was below the acceptable range for construct reliability at 0.4863. The low coefficient may indicate that the statements do not measure the same construct; or it may be due to the narrow range of responses invited for these statements.

Six of the statements described harmful attitudes or beliefs, whereas two statements, indicated healthy beliefs. S3 stated that CCLs require the same care and maintenance as prescription contact lenses, and S5 suggested that CCLs be disposed of within a prescribed wearing period. For purposes of analysis, the

responses to these statements were reversed so that agreement with the healthy belief would be represented by a “Disagree” response to the converse belief.

Table 4.17: Attitudes towards CCL Risk

RISK RELATIVE TO CCL PROPERTIES	Agree	Unsure	Disagree	Correlation Coefficient
S1 "I would wear the lenses even if they irritated my eyes"	9(0.05)	20(0.12)	135(0.82)	0,3016
S2 "CCLs are less harmful to the eyes than prescription contact lenses"	14(0.08)	115(0.70)	35(0.21)	0,2091
S3 “CCLs require the same care and maintenance as prescription contact lenses" (REVERSAL)	18(0.11)	68(0.41)	78(0.48)	0,0447
S4 "I would wear CCLs even if they did not give me clear vision"	8(0.05)	20(0.12)	136(0.83)	0,1039
S5 "I would throw these CCLs away after wearing them for 1 calendar month." (REVERSAL)	26(0.16)	62(0.38)	76(0.46)	0,1713
S6 "CCLs are designed to fit anyone; an eye test is not required for CCLs."	29(0.18)	75(0.46)	60(0.37)	0,2534
S7 "Monthly disposable CCLs can be used longer if they still look and feel okay."	17(0.10)	57(0.35)	90(0.55)	0,3918
S13 "CCLs cannot damage my eyes as they are only cosmetic appliances."	11(0.07)	76(0.46)	77(0.47)	0,3177

a) Item Analysis: Risks Relating to CCL Properties

Considering that the statements had a negative connotation, the response indicating safe practice was “Disagree”. However, disagreement was above 50% for only three items in this group.

The “Disagree” response for S1 was 82% (n=135) and 83% for S4 (n=136). A marginal 12% of “Unsure” responses were recorded for both items (n=20), and agreement was 5%. These items related to the tolerance of discomfort during CCL wear. The findings demonstrated that participants were generally averse to discomfort, and would not wear CCLs if they caused ocular or visual discomfort.

S7 only demonstrated a 55% “Disagree” response (n=90), with 35% of participants (n=57) indicating “Unsure”. This showed that participants were marginally more likely to dispose of lenses as regulated, but the high uncertainty rate suggested an attitude towards over wear of lenses amongst participants.

S5 related to scheduled disposal of CCLs, and 16% of participants (n=26) believed that CCLs could be kept for longer than the regulated wearing time. Only 46% of participants (n=76) disagreed with this statement, with the remaining 38% (n=62) indicating that they were unsure. The relatively high levels of agreement and uncertainty suggest that participants are unaware of the potential risk posed by CCLs.

A conspicuous “Agree” response proportion of 18% (n=29) was observed for S6. This item related to the belief that CCLs are able to fit anyone, making it unnecessary for an eye test. The “Unsure” responses were markedly high at 46% (n=75), and only 37% of participants (n=60) disagreed. These findings suggest participant uncertainty regarding the suitability of CCLs for all wearers, as well as towards optometric involvement in fitting CCLs. It is also likely, due to the relatively high agreement proportion, that participants believed that CCLs are generically suited to all wearers.

S13 tested the belief that CCLs could not cause ocular damage owing to their cosmetic nature. The responses to this statement showed 46% and 47% respectively of disagreement (n=77) and uncertainty (n=76). The marginal nature of this response made it difficult to gauge a true participant attitude, but may suggest other factors for the high “Unsure” response to the statement, including the possibility that it was poorly phrased.

S2 stated that CCLs were less harmful to the eyes than prescription contact lenses. This statement held the assumption that participants were aware of the risks related to prescription contact lenses. The results demonstrated clearly that the majority of participants (70%) were particularly unsure about this statement. Only 21% (n=35) disagreed with the statement.

S3 was concerned with the care and maintenance of CCLs, once again using a comparative statement assuming participant knowledge of prescription contact lenses. Contrary to the effect experienced in S2, 48% of participants indicated their belief that care and maintenance was the same for CCLs as for prescription

contact lenses. However, the 41% uncertainty (n=68) confirmed only that participants were confounded by the assumptions in the statement.

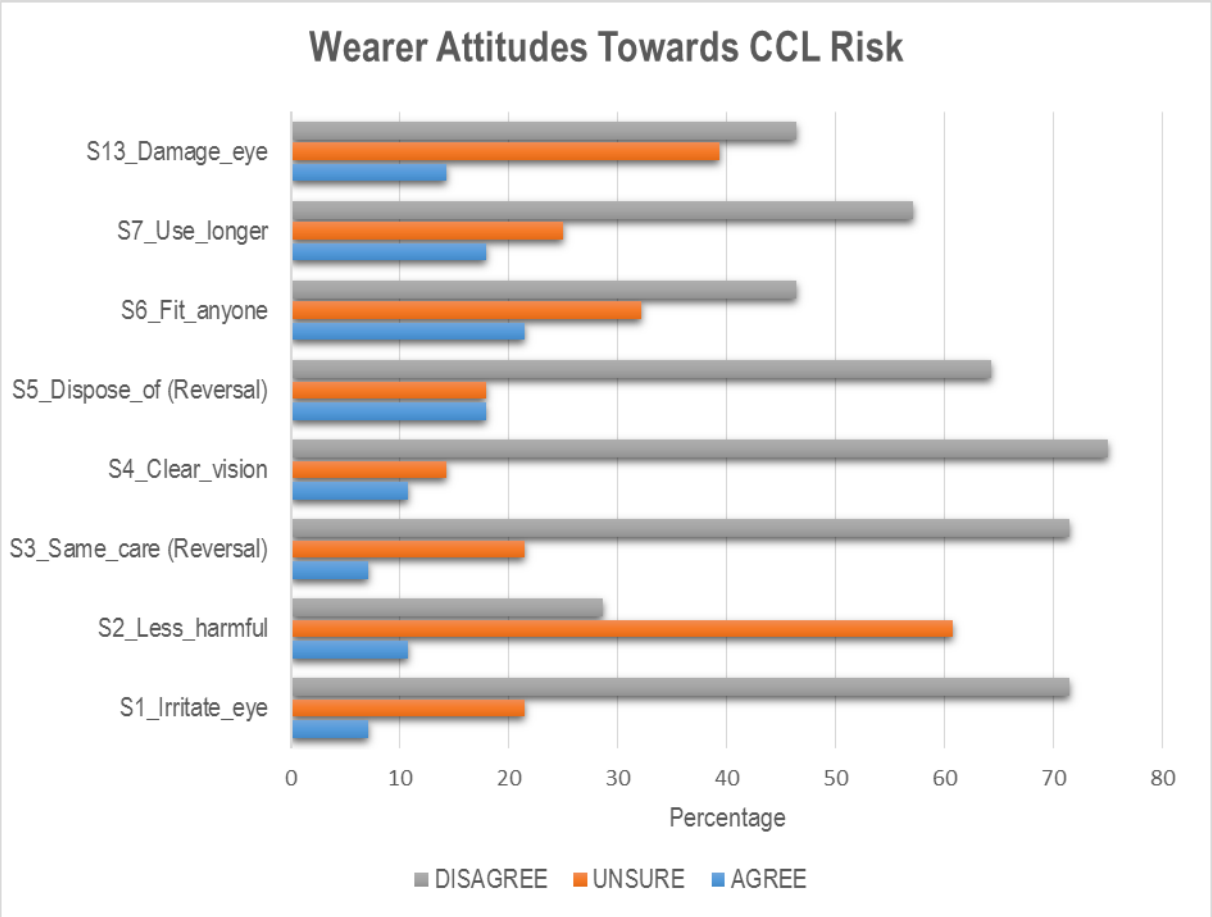

Figure 4.20: Wearer Attitudes to CCL Risk

b) Wearer Attitudes to CCL Risk

When considering the attitudes of CCL wearers, it was interesting to note that wearers demonstrated significant disagreement with five of the eight statements. Twenty wearers (71%) disagreed with S1 and 21 (75%) disagreed with S4 relating to ocular and visual discomfort. Uncertainty was demonstrated by six wearers regarding S1 (21%) and four wearers (14%) for S4. Two wearers (7%) agreed that they would wear lenses if they irritated their eyes and three wearers (11%) indicated that they would wear lenses even if they did not get clear vision. In view of the previously discussed CCL-aware findings, wearers demonstrated a marginally higher tendency to use CCLs regardless of discomfort.

Twenty wearers (71%) disagreed and six (21%) indicated uncertainty with S3. This suggested that the majority of wearers understood that CCL care was equivalent to prescription contact lens care. However, S2 reflected the high

uncertainty reported previously, regarding the potential for harm, with 17 wearers (61%) selecting “Unsure” and only eight wearers disagreeing with the statement.

Eighteen wearers (64%) disagreed with S5, whilst five (18%) agreed and the remaining five (18%) indicated that they were unsure. This suggested that, although there was a tendency for wearers to observe safe scheduled disposal practices, there was a substantial proportion of wearers who followed unsafe behaviours in this regard. S7 demonstrated 57% disagreement (n=16) suggesting that the remaining 12 wearers (43%) were likely to over wear their CCLs.

Thirteen wearers (46%) disagreed with S6 whilst six wearers (21%) agreed. This was in response to the statement “CCLs are designed to fit anyone; an eye test is not required for CCLs”. Nine wearers (32%) were unsure. This confirmed the findings in the larger group, suggesting that more than half of CCL wearers believed that CCLs were generically suited to all wearers, which, by implication, challenged the need for optometric involvement during CCL fitting.

S13 "CCLs cannot damage my eyes as they are only cosmetic appliances" attracted 13 responses for “Disagree” (46%), 11 for “Unsure” (39%) and four for “Agree” (14%). This closely followed the responses of the larger group, and strengthens the suggestion of a response confounded by unclear phrasing of the statement.

c) Bivariate Analysis of CCL Safety Risk

Three main themes were identified and analysed using bivariate analysis. They included: ocular and visual discomfort (S1 and S4); scheduled disposal of CCLs (S5 and S7); and potential for harm (S2 and S13). S3 and S6 did not demonstrate statistical significance or correlation when conducting item analysis, and were therefore not included in bivariate analysis.

d) Ocular and visual discomfort

With regard to statements S1 "I would wear the lenses even if they irritated my eyes" and S4 "I would wear CCLs even if they did not give me clear vision", the response proportions were found to be associated ($p=0.023$) and moderately correlated ($r=0.2294$). For wearers, this correlation coefficient was substantially higher ($r=0.5647$).

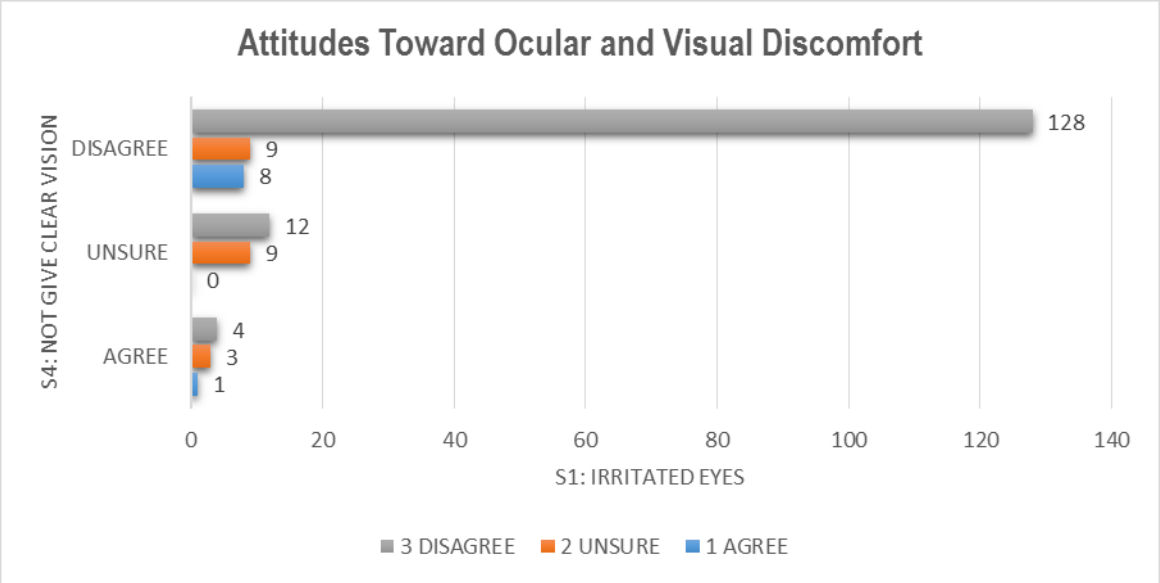

Figure 4.21: Attitudes toward Ocular and Visual Discomfort

Participant disagreement was 83% (n=145) for S1 and a similar proportion (n=146) disagreed with S4. Disagreement was common to both statements at 87.67% (n=128). Less than 5% of CCL-aware participants agreed with these statements. A moderate 12% (n=21) of respondents demonstrated an attitude of uncertainty for each of the statements.

This analysis demonstrated that ocular and visual discomfort would generally not be tolerated by the study population in favour of CCL wear. Wearers displayed a proportionally higher agreement with these statements, although this effect may be explained by the smaller sample size.

e) Scheduled CCL disposal

Attitudes toward appropriate CCL disposal schedules were gauged by comparing S5: "I would throw these CCLs away after wearing them for 1 calendar month" with S7: "Monthly disposable CCLs can be used longer if they still look and feel okay". The responses to S5 were reversed for purposes of analysis, therefore any “Agree” responses were treated as “Disagree” in the analysis and vice versa.

The statements were shown to be associated (p=0.0001) but weakly correlated (r=0.2331). An interesting observation was that this correlation weakened (r=0.1125) when the analysis was conducted with responses from wearers only, possibly due to the uniformity of responses in the sample.

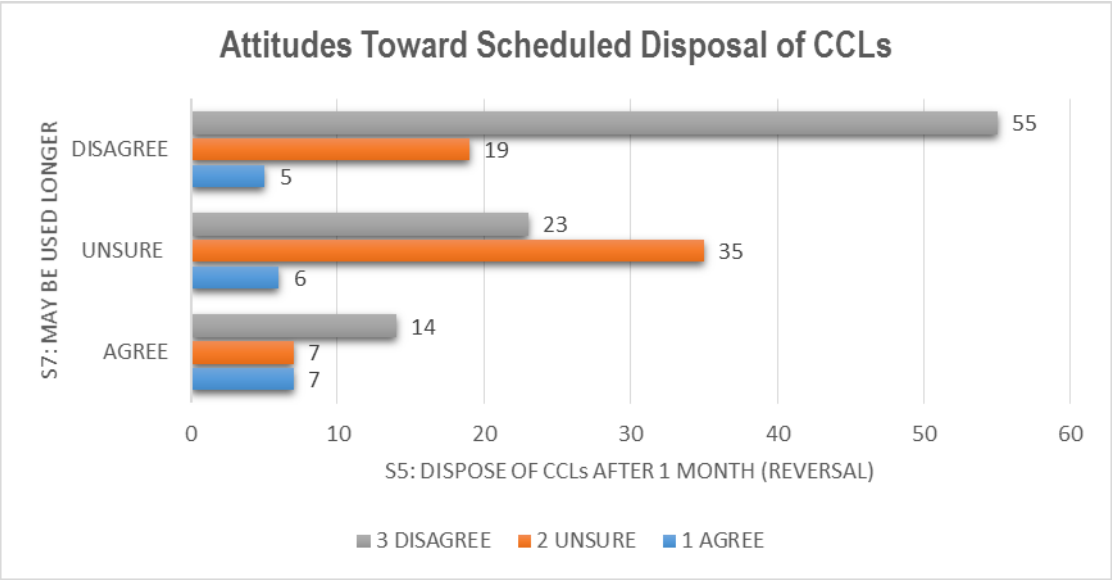

Figure 4.22: Attitudes toward Scheduled Disposal

Disagreement was indicated by 53.80% (n=92) of responses for S5 and 46.20% (n=79) for S7 with 55 participants selecting “Disagree” for both statements. The “Unsure” responses were 37.43% (n=64) for S7 and 35.67% (n=61) for S3, with 35 commonly selecting “Unsure”. Of the 28 “Agree” responses to S7, only 25% (n=7) were common with S5.

The results demonstrated a moderate consensus that CCLs should be disposed of according to a regulated schedule, however there remained a high uncertainty amongst CCL-aware participants regarding the disposal of CCLs. Wearers demonstrated a similar proportional distribution of attitudes towards scheduled disposal.

f) CCLs as cosmetic appliances

The statements suggesting that CCLs posed little harm to the eyes due to their cosmetic nature (S2 and S13) were analysed to determine participants’ attitudes towards the possibility of harm resulting from CCL wear. S2 stated: “CCLs are less harmful to the eyes than prescription contact lenses" while S13 suggested: "CCLs cannot damage my eyes as they are only cosmetic appliances."

The two statements were found to be significantly associated (p=0.0000), and Pearson’s coefficient (r=0.3089) demonstrated moderate strength of correlation.

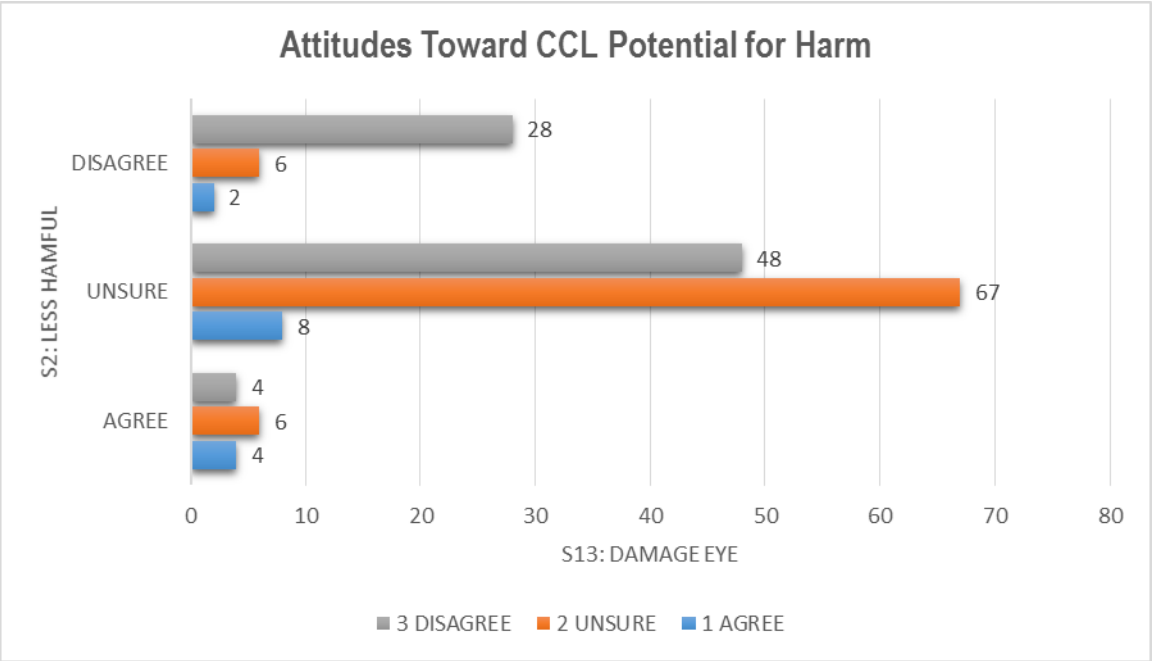

Figure 4. 23: Attitudes toward CCL Potential for Harm

The most noticeable feature of the data for this theme was the proportionally high uncertainty demonstrated across the two statements. S2 had a 71% "Unsure" response (n=123), of which 54.47% (n=67) was common to S13. Disagreement with the statements was at 21% (n=36) for S2 and 46% (n=80) for S13. Agreement was low for both statements (5.75% for S2 and 8.05% for S13).

The results of this analysis demonstrate that participants did not agree with the concept that CCLs could not harm the eyes due to their cosmetic nature. However, the lack of explicit disagreement with S2 suggested that participants believed that CCLs could not cause harm. It was then debated whether participant indecision was related to the cosmetic nature of CCLs; or whether participants were unsure if harm could occur from contact lens wear at all.

4.4.2 Hygienic CCL Usage

Five statements as indicated in Table 4.18, comprised this subsection of the questionnaire. Cronbach's alpha for this group of statements was below the acceptable range for construct reliability at 0.4849, and generalizability of this model can therefore not be recommended.

Table 4.18: CCL Hygiene Behaviours

CCL HYGIENE BEHAVIOURS	Agree	Unsure	Disagree	Correlation Coefficient
S8 "It is okay to swop used CCLs with friends."	6(0.04)	15(0.09)	150(0.88)	0.3257
S9 "I can sleep with CCLs in my eyes."	7(0.04)	37(0.22)	127(0.74)	0.2521
S10 "I need to buy special cleaning solutions to clean my CCLs." (Reversal)	9(0.05)	52(0.30)	110(0.64)	0.3197
S11 "I could use tap water to rinse my CCLs."	10(0.06)	74(0.43)	87(0.51)	0.2972
S12 "I could put the lens in my mouth to clean it off in an emergency."	12(0.07)	33(0.19)	126(0.74)	0.1410

a) Summary of Item Analysis

There was a general disagreement across the five statements, with “Agree” responses falling below 10% for all items. S8 demonstrated 88% participant disagreement. S9 and S12, although demonstrating 74% disagreement each, revealed significant levels of uncertainty (22% and 19% respectively) with S12 demonstrating the highest number of participants (n=12) who indicated they agreed with the statement. S10 and S11 revealed lower disagreement and higher levels of uncertainty. The option of “Disagree” was selected for S10 by 64% of participants (n=110), whereas only 51% (n=87) selected “Disagree” for S11. “Unsure” responses were 30% for S10 (n=52) and 43% for S11 (n=74).

Analysis of these findings suggest that participants tend to avoid overt high risk behaviours of sharing lenses, sleeping in lenses and using saliva to clean lenses. However, participants demonstrated a high degree of uncertainty towards exposure of lenses to tap water, and to a lesser extent, the need for special cleaning solutions.

b) Bivariate Analysis of Hygienic CCL Usage

The items were further analysed relative to themes of CCL cleaning behaviours (S10 and S11) and high-risk behaviours (S8 and S12). When tested for correlation and statistical significance, S9 did not demonstrate statistical significance or correlation when conducting item analysis, and was therefore not included in further bivariate analyses.

c) CCL cleaning behaviours

The responses to S10 "I need to buy special cleaning solutions to clean my CCLs" were reversed for purposes of analysis, and analysed against S11 "I could use tap water to rinse my CCLs". For this reason, any “Agree” response to S10 was coded as “Disagree”.

The two statements were found to be significantly associated ($p<0.001$), and Pearson’s coefficient ($r=0.2881$) demonstrated moderate strength of correlation.

The proportion of responses indicating “Disagree” was 64.94% (n=113) for S10, and 50 % (n=87) for S11, of which 68 responses were common to both statements. There were 77 “Unsure” responses (44.25%) for S11 compared to 52 (29.89%) for S10. This uncertainty existed amongst 17.86% of wearers (n=5), although disagreement was proportionally higher at 71.43% and 78.57% for S10 and S11 respectively. Agreement was at 5.75% (n=10) for S11 and 5.17% (n=9) for S10; and amongst wearers, 10.71% agreement was observed with S10 (n=3) compared with 3.57% (n=1) for S11.

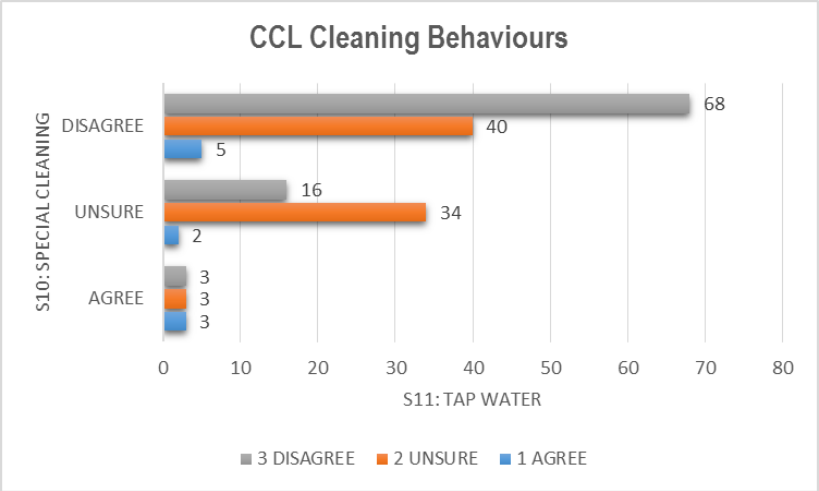

Figure 4.24: CCL Cleaning Behaviours

The results of the analysis revealed that participants were aware of the need for special cleaning solutions for use with CCLs. However, there was a substantial proportion of wearers who demonstrated uncertainty and even indicated agreement with harmful practices relating to the use of special cleaning solutions. There was also an attitude of uncertainty regarding the use of tap water to clean lenses. A smaller proportion of CCL wearers demonstrated this uncertainty which indicated a tendency toward safer CCL practices amongst CCL wearers than suggested by the attitude of the general CCL-aware participants.

d) CCL high-risk behaviours

Attitudes toward high-risk behaviours for microbial keratitis were evaluated by comparing S8 "It is okay to swop used CCLs with friends" and S12 "I could put the lens in my mouth to clean it off in an emergency".

The statements were analysed for correlation, and a modest correlation was observed (r=2.586). The response distribution was found to be statistically significant (p<0.001).

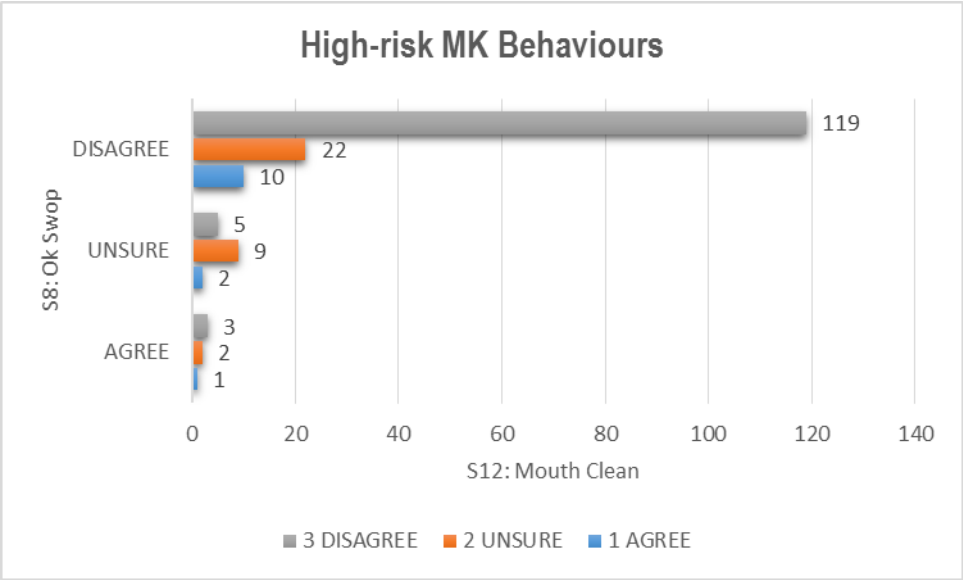

Figure 4.25: High-risk MK Behaviours

A disagreement response of 87.28% (n=151) was observed with S8, followed by S12 with 73.41% (n=127). The two statements shared 119 common “Disagree” responses. S8 had 9.20% “Unsure” responses (n=16) when compared with

18.97% for S12 (n=33). The agree responses were 7.47% for S12 (n=13) and 3.45% for S8 (n=6).

When considering these data for wearers, the correlation coefficient increased (r=0.4913). Disagreement with S8 was high (96.42%) with only one participant indicating agreement. Disagreement with S12 demonstrated a lower proportion (78.57%), with 6 wearers (21.43%) indicating that they either agreed with- or were unsure about this practice.

Analysis of the results demonstrated that participants had an overall healthy aversion towards the practice of swopping lenses with friends, but demonstrated a fair amount of uncertainty regarding the dangerous practice of using saliva to clean CCLs. The latter finding was particularly concerning, considering that the wearer group demonstrated a similar trend.

4.5 ATTITUDES AND PRACTICES TOWARDS PROCUREMENT OF COSMETIC CONTACT LENSES

The third objective in this study was to determine CCL procurement practices amongst the study population. The questions were posed to all CCL-aware participants and were asked against the same scenario, suggesting that the participant had obtained a pair of monthly disposable lenses. Three questions were posed to gauge the attitudes towards procurement amongst CCL-aware participants, offering multiple choice as well as open-ended options. The aspects of CCL procurement investigated by these questions related to the source of the CCLs, training and instruction in the use of CCLs and aftercare in case of an adverse event. The findings of these procurement-related questions were statistically analysed using Pearson's Chi-square test for independence, each question was found to be associated with the other two ($p<0.001$).

4.5.1 Sources of CCL Procurement

When asked about the sources from which they would procure CCLs, 69.02% of CCL-aware participants (n=127) indicated that they would wear CCLs procured from an optometric practice. As for procurement from a beauty shop, 16.85% (n=31) CCL-aware participants selected this option. The option of wearing lenses obtained from a friend was selected by 6.52% of CCL-aware participants (n=12). A negligible percentage of participants indicated that they would wear cosmetic contact lenses obtained online (2.17%), from a night club/ party promotion (1.09%) and from a flea market (0.54%). Five participants (2.72%) selected "Other", suggesting "Chemist" "All of the above" and "None of the above" as responses.
The responses were combined to form two categories as illustrated in Table 4.19. This demonstrated only regulated and unregulated procurement options as currently available in South Africa. Thus 28% of CCL aware participants indicated that they would wear lenses obtained from an unregulated source.

Table 4.19: Preferred CCL Procurement Sources

	UNREGULATED	REGULATED	GRAND TOTAL
Non-wearers	38(0.26)	107(0.74)	145
Wearers	10(0.36)	18(0.64)	28
Grand Total	48(0.28)	127(0.73)	173

4.5.2 Instruction and Guidance on CCL Use

CCL-aware participants demonstrated a preference for professional instruction over lay instruction (Table 4.20), which included sources such as friends and online help. The percentage of wearers who indicated they would pursue lay instruction was higher at 29% than for non-wearers (24%). This was investigated further during the QUAL interviews.

Table 4.20: Instruction Preferences of CCL-aware Participants

	LAY INSTRUCTION	PROFESSIONAL INSTRUCTION	GRAND TOTAL
Non-wearers	34(0.24)	110(0.76)	144
Wearers	8(0.29)	20(0.71)	28
Total	42(0.24)	130(0.76)	172

4.5.3 CCL Aftercare and Assistance for Adverse Events

CCL procurement as defined in the present study, incorporated the processes of pre-trial assessment, instruction, follow-up and aftercare. The third procurement question required participants to select the mode of care they would pursue in the case of an adverse event or infection.

Table 4.21: Care Preferences of CCL-aware Participants

	SELF-CARE	OPTOMETRIC/ MEDICAL CARE	GRAND TOTAL
Non-wearers	20(0.14)	124(0.86)	144
Wearers	5(0.18)	23(0.82)	28
Total	25(0.15)	147(0.85)	172

The majority (85%) of CCL-aware participants indicated they would seek help from an optometrist or medical professional rather than pursing self-care options such as over-the counter eye drops, a home remedy or online help (Table 4.21). The percentage of wearers who indicated they would pursue self-care options was 18% (n=5). This was investigated further during the QUAL interviews.

4.6 QUALITATIVE INTERVIEWS

Interviews were conducted with CCL wearers in order to gather QUAL data on their CCL procurement practices. QUAL data were coded and analysed according to themes relating to procurement practices.

Eight wearers responded to the interview invitation (Table 4.22). An example of of an interview transcripts is available as Appendix H

Table 4.22: QUAL Demographic Data

ID	3,17	4,01	5,05	6,23	7,01	7,26	8,09	13,25
GENDER	F	F	M	F	F	F	M	M
AGE	20	20	20	18	26	33	31	21
FACULTY	FID	AppSc	Ed	HWSc	Bus	Bus	HWSc	Bus
CAMPUS	CT	CT	MB	CT	CT	CT	BV	CT
FINANCIAL	1	2	2	3	3	2	2	3
ETHNICITY	C	B	C	C	B	C	W	C
ORIGIN	WC	OA	WC	WC	WC	WC	WC	WC
LEE	<2	<2	>2	<2	<2	<2	<2	<2

4.6.1 Demographic description

Five of the eight were female and three were male. Ages ranged from 18 to 33 years, with a mean age of 23.6 ± 5.7 years. Three participants were from the Business faculty, two from Health and Wellness Sciences, and one each from the faculties of Education, Applied Sciences and Informatics and Design. Only the Engineering faculty was not represented in this QUAL phase. The majority of interviewees were from the Cape Town campus (n=6) with Bellville and Mowbray campuses represented by only one participant each.

Five interviewees were of Coloured ethnicity, two of Black ethnicity and one of White ethnicity. All but one of the interviewees were originally from the Western Cape; the remaining participant (4.01) indicating a neighbouring African country as

her place of origin. Self-reported financial status demonstrated a mean of 2.25 ± 0.7, and only one interviewee indicated that she struggled to afford basic items.
Five of the eight participants indicated their residential area as the Cape Flats, whilst the remaining three resided in the City Bowl, Blaauwberg and Northern Suburbs areas. Only one participant (5.05) indicated that their last eye exam had been more than two years prior to the interview.

Table 4.23: Behaviour Scores

ID	3,17	4,01	5,05	6,23	7,01	7,26	8,09	13,25
Vanity Score	1	2	2	3	1	3	1	1
Risk Score	1	0	0	0	0	0	0	1
Social Score	2	0	2	1	0	1	2	2
Health Score	3	2	2	1	0	1	3	1

The behaviour scores for the group were reviewed alongside the QUAL data. The mean score for Vanity behaviours which ranged from 1 to 3 was 1.75 ± 0.89. This was followed by the Health score, which ranged from 0 to 3, with a mean of 1.63 ± 1.1. The Social score ranged from 0 to 2 with a mean of 1.25 ± 0.89 and the lowest behaviour category was the Risk score at 0.25 ± 0.46.

4.6.2 Procurement and Usage Experiences

Table 4.24 summarised the findings of the interview. Six wearers wore plano CCLs whilst two wore prescription CCLs. Both interviewees who wore prescription CCLs had obtained their lenses from an optometrist. Interviewee 3.17 was a current wearer CCLs whilst 8.09 had discontinued wear.

Optometric procurement

Five interviewees indicated that they had obtained their CCLs directly from an optometrist, with varying levels of pre-trial assessment, training and aftercare. Pre-trial assessment was only reported for four of the five who had made use of optometric procurement. Interviewee 13.25 stated that he had merely ordered the CCLs based on the colour he wanted. In addition, he did not receive professional instruction but lay training from a family member, and no aftercare was provided. In fact, aftercare was lacking in the experiences of all but two of the interviewees.

Professional instruction was reported as sufficient by only three interviewees. The remainder of the interviewees obtained or supplemented their lens care and maintenance information from lay sources such as friends and the internet.

Unregulated procurement

The other three interviewees had obtained their lenses from friends or family. None of the interviewees who had obtained their lenses from unregulated sources had received any pre-trial assessment or aftercare.

Table 4.24: QUAL Inventory of Wearer Procurement and Usage Practices

ID	3,17	4,01	5,05	6,23	7,01	7,26	8,09	13,25
Plano/ Rx	Rx	PLANO	PLANO	PLANO	PLANO	PLANO	Rx	PLANO
Current Wearer	Y	-	-	-	Y	-	-	-
Source	OPTOM	FRIEND	FRIEND	OPTOM	OPTOM	FRIEND	OPTOM	OPTOM
Pre-trial Assessment	Y	N	N	Y	Y	N	Y	N
Instruction	OPTOM	LAY	LAY	OPTOM	OPTOM	LAY	OPTOM	LAY
	FAIR	POOR	POOR	FAIR	POOR	POOR	FAIR	POOR
Aftercare	N	N	N	Y	N	N	Y	N
Unsafe Practice[1]	OW	SH	RS	-	OW	OW	SL	OW
Adverse Event	Y	Y	-	-	-	-	-	-
CCL Risk Belief	Y	Y	Y	Y	Y	-	Y	-
Comfort Sensitive	Y	Y	-	Y	Y	-	Y	-
Cost Sensitive	Y	-	-	-	Y	Y	Y	-

Unsafe practices of CCL over wear were described by four interviewees, with one admitting to sleeping with lenses in the eyes, another indicating he had re-used solution and still another revealing that she had engaged in the harmful practice of sharing lenses.

[1] Unsafe practices referring to *overwear* (OW), *sharing* (SH), *re-using solution* (RS) and *sleeping in lenses* (SL)

Only two wearers reported having experienced adverse events related to CCL wear. Both wearers had engaged in harmful CCL usage practices. Neither of these resulted in permanent damage to the wearers' eyes.

Table 4.25: QUAL Thematic Analysis

ID	3,17	4,01	5,05	6,23	7,01	7,26	8,09	13,25
CCL Risk Belief	Y	Y	Y	Y	Y	-	Y	-
Comfort Sensitive	Y	Y	-	Y	Y	-	Y	-
Cost Sensitive	Y	-	-	-	Y	Y	Y	-

4.6.3 QUAL Themes

Three themes were identified during content analysis of the QUAL interviews.

a) Harm

The first theme was wearer belief that CCLs, if used incorrectly, could harm the eyes. Only two wearers (7.26 and 13.25) indicated that they did not believe that CCLs posed any risk to the eyes. It was important to note that these wearers did not receive appropriate CCL training and had both demonstrated poor procurement practices.

b) Comfort

The second theme related to the intolerance of discomfort. Words relating to discomfort such as 'irritate', 'scratch', or even 'tired eyes' were noted as being related to comfort. Five interviewees alluded to comfort as an important component of their wearing experience. All wearers who were identified as comfort sensitive believed that CCLs could potentially cause harm to the eyes if not used correctly.

c) Cost

The final theme was cost sensitivity. Four wearers made reference to the expense of the CCLs. Interviewee 8.09 indicated cost as one of his reasons for discontinuing CCL wear, while 7.01 stated that she used the Expressions brand of lenses despite cost, but did indicate that she wore the lenses for two months. Interviewee 3.17 confessed that she too wore her lenses beyond the scheduled

disposal period due to cost, and 7.26 stated that she considered the expense of procuring CCLs from an optometric practice excessive, and would consider obtaining her next pair of lenses from a source who could provide them at a discounted rate. Cost sensitivity was therefore considered as a contributor to high-risk behaviours with CCLs.

CHAPTER 5: DISCUSSION

5.1 INTRODUCTION

Cosmetic contact lens (CCL) awareness, prevalence, procurement and usage practices have not been comprehensively reported in the South African context. The results of this study provided the evidence required to describe CCL exposure, procurement and usage practices amongst students attending a university in Cape Town, South Africa.

The study population was selected to represent young adults residing in the Cape Town metropolitan region. The sampling strategy was designed to include students from all faculties across city campuses of the Cape Peninsula University of Technology (CPUT), as this institution had a notably diverse distribution of students. This diversity was demonstrated by the demographic findings. However, owing to the sampling frame, caution should be exercised in generalising these findings to the greater community of young adults in Cape Town, South Africa.

5.1.1 Definitions

For the purposes of this study, the following three concepts were defined as follows:

i. ‘Exposure’ was a broad term used to incorporate both awareness and wearing experience.
ii. The term ‘procurement practices’ referred to the manner in which the cosmetic contact lenses were obtained. It included four elements: the vendor; pre-trial examination; instruction and training; and follow-up and aftercare.
iii. ‘Usage practices’ referred to CCL wear, handling, care and maintenance.

The study aimed to answer two Research Questions:

i. To what extent are students, attending a university in Cape Town South Africa, exposed to cosmetic contact lenses?

ii. What procurement practices exist; and do they have any influence on usage practices associated with these lenses?

A mixed method approach was employed for this descriptive study design. The research instrument for the quantitative (QUAN) component was a questionnaire-based survey conducted with randomly selected student clusters to determine CCL awareness and usage across the study population. This was followed sequentially by individual interviews, which gathered qualitative (QUAL) data from CCL wearers only.

The study objectives were:

- to ascertain the levels of exposure to CCLs amongst students attending a university in Cape Town, South Africa;
- to determine the CCL procurement practices of students attending a university in Cape Town South Africa;
- to describe the CCL usage practices amongst students attending a university in Cape Town South Africa; and
- to describe the relationship between modes of procurement and CCL usage practices among students attending a university in Cape Town South Africa.

Primary evidence was interpreted and categorised according to: demographic data, prevalence of use, eye care history and self-reported student behaviours for all participants. CCL knowledge and attitudes were reported only for those students who were CCL-aware. Experiences, as described during interviews, were interpreted as supporting evidence for procurement and usage practices of CCL wearers.

The focus of this Chapter was to link the findings of the study with current literature so as to strengthen the evidence base for CCL research in both the local and global contexts.

5.1.2 Study Limitations

a) Sampling strategy

The sampling strategy did not allow for a fully representative sample in this study. Efforts to ensure that all faculties were represented revealed a skewed representation of demographic and behavioural characteristics. This was also demonstrated by homogeneity of clusters. A stratified random sampling technique (Bryman, 2012) may have produced different findings to those described in this study. However, as it was not the aim of this study to generalise the findings to the greater population, the sampling-related error did not disrupt the aim and objectives of this study, in describing the results peculiar to the CPUT student population.

b) Sample size

A larger sample size may have improved the strength of correlation coefficients and narrowed the confidence intervals. However, owing to the homogeneity displayed in the faculty groups surveyed, it is the opinion of the researcher that these effects would persist.

Future studies of this nature should take a comparative stance rather than attempting to generalise the findings to the entire student population. Allowance should also be made for non-response of up to 15%.

c) Clinical evaluation

An objective clinical evaluation was outside the scope of this study and the study relied on self-reported health beliefs, which assumed the absence of adverse events based on a response to the question: “Have you ever experienced an infection or irritation of your eye when wearing CCLs?” Once again, the nature of this type of self-reported attitudes questionnaire was subject to reporting bias (Brener, et al., 2003). However, it was hoped that the use of an imaginary scenario would control for the situational factors to gauge, as accurately as possible, students’ attitudes towards CCL risk behaviours.

A clinical component would have provided concrete clinical evidence to contribute towards the knowledge base for CCL wearer inputs and outcomes. Future research should endeavour to include clinical evaluation of wearers.

d) Online CCL purchases

A specific question seeking to test students' tendencies to engage in online or casual procurement would have provided a more solid basis for the study findings. It would have been of particular value to this study to evaluate these questions amongst the CCL-aware participants who indicated they would consider future CCL wear.

5.2 PARTICIPANT EXPOSURE TO COSMETIC CONTACT LENSES

The study described in this thesis did not assume CCL wearer prevalence, but aimed to describe CCL awareness, attitudes and practices. The first research question related to the extent of CCL exposure in the target population. 'Exposure' was a broad term used to incorporate both awareness and wearing experience.

5.2.1 Demographic Data

a) Gender

In addressing CCL exposure, it was necessary to interpret how the demographic characteristics of the study sample were related to CCL awareness and wearer prevalence. As demonstrated throughout the literature, CCL awareness in the present study was higher amongst female than male participants, as summarised in Table 4.2: *Cross-tabulation of CCL Exposure and Gender Data*. This has been attributed to the cosmetic advantage offered by these lenses, which tends to attract more female wearers (Morgan & Efron, 2009).

b) Ethnicity

A study conducted in Durban South Africa, described CCL wear amongst various ethnic groups (Moodley, 2009) for the purposes of determining the generic suitability of lens parameters. When considering the findings of the present study relative to regional demographics, as summarised in Table 4.8: *CCL Awareness by Ethnic Distribution*, the low prevalence of CCL wear amongst participants of Black ethnicity (4.37%) does not align with the high proportion of Black subjects in Moodley's study. However, this difference may be explained by the different

sampling strategies of the two studies, as participants in the Durban study purposely sought out students presenting at a university clinic specifically for CCLs whereas the strategy of the study under discussion was random cluster sampling of a general student population.

c) Socio-economic status

In the South African context, socio-economic and ethnic factors continue to be intertwined due to the socio-political history of the country. In addition, South Africa continues to recover from the social engineering of its Apartheid-governed past which defined the geographic concentration of ethnic groups, as illustrated by Figure 4.9. Ethnicity has also demonstrated associations with financial status as shown in Table 4.10 in the present study. Singh *et al* reported that in their study on microbial keratitis (MK) subsequent to CCL use, the majority of patients were from lower socio-economic groups. In the present study, only 2.7% of those who identified themselves as being unable to afford basic items indicated that they had worn CCLs (Table 4.9: *CCL Awareness by Financial Status*). This finding could however be due to cultural context rather than socio-economic status. CCLs are generally advertised emphasising the cosmetic as opposed to functional benefits and may contribute to it being considered as a luxury that financially disadvantaged students view as unaffordable.

5.2.2 Wearer Prevalence

The wearer prevalence reported in the literature has varied significantly which may be attributed to the significant differences in aims, design and study populations utilised. A 12-year longitudinal practitioner survey in the United Kingdom reported a CCL prevalence of 4.6% of soft contact lens fits (Morgan & Efron, 2009). A similar study in Singapore incidentally observed 6% of emmetropic contact lens wearers, identifying them as CCL wearers (Charm, et al., 2010). Yet another study on prescribing patterns in India reported a 5% CCL wearer prevalence, tabulated against the global status of 3% and the Asian status at 20% (Thite, et al., 2013). Most recently, the CCL wearer prevalence in a Saudi Arabian cross-sectional study amongst female wearers was reported at 70.2% (Abahussin, et al., 2014).

As not all CCL wearers obtain their lenses from optometrists, the studies evaluating contact lens fitting patterns amongst practitioners had limited value in determining accurate wearer prevalence data in populations that procure their CCLs from sources other than optometrists. In addition, certain optometric practices may have been omitted due to selection bias, and the secondary information based on ten concurrent contact lens fittings could additionally exclude a fair proportion of CCL wearers. The cross-sectional Saudi Arabian study collected data from a known, high-prevalence wearer group of female students. The substantial prevalence demonstrated by this group may be explained by participant demographics and cultural practices.

This study set out to determine the extent of CCL awareness in a study population, whilst incidentally identifying CCL wearers from the sample. The resultant prevalence of CCL wearers identified by this study was 7.11%. This percentage was marginally higher than those reported by the studies conducted in India and Singapore.

5.2.3 Self-reported Student Behaviours

In an attempt to gain insight into student behaviours, with the possibility of linking these to CCL usage behaviours, participants were requested to select five behaviour statements which described them best. Self-reported health-risk behaviours are seldom of scientific value, as they are prone to broad subjective interpretation (Brener, et al., 2003). To this end, the responses as detailed in Figure 4.14: *Self-reported Behaviours*, demonstrated a varied distribution. These data were analysed by categorising them into four scoring categories, namely: vanity, health, social and risk.

Scores, ranging from low to high were created for each participant by combining the number of category-related statements. This resulted in a three-level score: low, medium and high for each category. Unfortunately, only 69% of participants followed the instruction to select five statements, which may have altered the results to some extent.

A higher 'Vanity' score was found to be associated with CCL wearers as described in Table 4.15: *CCL Wearing Experience by Vanity Score.* This finding suggested that CCL wearers were more concerned about their appearance than non-wearers.

The Health score distributions were almost identical for both CCL-aware and unaware participants (Figure 4.16) and the Social score was also found to have no association with CCL awareness (Figure 4.17). Although no association was found between wearing experience and risk behaviours, it is worth noting that the majority of CCL wearers (60.7%) did not select a single risk-related statement (Table 4.16).

Brener *et al* have cautioned that self-reported behaviours are both cognitively and situationally framed by respondents and are therefore subject to reporting bias (Brener, et al., 2003). Responses relating to high-risk behaviours are therefore often underreported and those demonstrating a perceived positive behaviour are over reported. This effect seems to have been demonstrated in the present study.

5.3 COSMETIC CONTACT LENS PROCUREMENT AND USAGE PRACTICES

The second research question posed in this study sought to identify the procurement practices amongst wearers and determine whether they had any influence on CCL usage practices.

5.3.1 Procurement Practices Observed in the Study

a) Optometric Procurement

The majority of CCL-aware participants indicated that they preferred optometric procurement above unregulated procurement as demonstrated in Table 4.19.

Although this was initially viewed as a positive and healthy trend, it was discovered, on closer investigation, that optometric sourcing of CCLs promoted an unfounded sense of security in wearers. More than 50% of wearers who had procured CCLs from optometric sources, reported that they had obtained these lenses without the necessary pre-trial assessment, instruction or aftercare.

Moodley's study also highlighted a procurement trend in South Africa, whereby non-prescription CCLs were provided by optometrists to potential wearers 'over-the-counter' on request, without any pre-trial fitting or ocular health assessment (Moodley, 2009). This was corroborated in the present study by interviewee 13.25 who described his experience of CCL procurement as follows:

> *Well my sister got lenses so I wanted to try it as a fashion statement; and so I went to the optometrist she got hers from, and I asked for the colour I wanted. (No eye test).*

The interviewee went on to state that he had received training from his sister but that no follow-up appointments for aftercare were arranged with the optometrist. The dangers of insufficient instruction on CCL cleaning and storage by optometrists have been described in a South African case report describing corneal scarring secondary to CCL wear (van Zyl & Cook, 2010). The evidence presented by van Zyl and Cook demonstrated the dangers of providing CCLs to young wearers without appropriate education on cleaning and storage. The severe consequences of unmonitored CCL use by uninformed young adults in Cape Town, as described in the case report by van Zyl and Cook, were attributed to the failure of optometrists to provide the appropriate pre-trial assessment, training and instructions. A practice that was described by a number of wearers who were interviewed in this study.

This practice by some optometrists of handing over CCLs to patients without following the regulated clinical protocols is in violation of the HPCSA ethical rules and could result in the practitioner facing a charge of clinical negligence if reported. Wearers also believed that they were using their lenses in a healthy way, despite all admitting to occasional lapses in healthy behaviours.

The optometric inadequacies described by wearers seemed to reinforce the perception held by some wearers that CCLs need not be procured from a regulated source, especially if they could procure these lenses elsewhere at lower cost.

b) Online CCL procurement

A surprising finding was the low proportion of CCL wearers who indicated that they would wear CCLs procured via an online purchase, given the reported increase in general online shopping amongst South African young adults. Despite the growing number of online sources advertising low-cost plano CCLs, none of the interviewees had obtained lenses from online sources. This was in keeping with the survey findings. When asked about online purchases, interviewee 4.01 stated:

> *The problem with (obtaining) lenses online is that you don't know if it's in good condition or not.*

This was a particularly significant finding, since online advertisers market CCLs in the same way as any harmless accessory or cosmetic products to potential wearers, who are naïve to the sight-threatening risks posed by these lenses. Recent market research reports (ITWeb, 2012) have described a significant increase in online purchasing habits of young consumers. It is important that organized optometry utilize local and national media to educate the public about the sight-threatening risks posed by these lenses if not accompanied by the appropriate care.

Quality and safety emerged as two important elements for successful CCL wear. It was established that the majority of wearers were aware that CCLs posed a preventable health risk. The perceived lack of quality assurance linked to online procurement seemed sufficient to deter both prospective and experienced CCL wearers.

5.3.3 Wearer attitudes governing CCL Procurement

a) CCL Pre-trial Fitting

More than half of CCL wearers did not disagree with the statement that CCLs were generically designed to fit all wearers and therefore did not require an eye test. This suggested the potential for unsavoury procurement behaviours related to this belief, and challenged the need for optometric involvement during CCL fitting.

The findings of the Durban study on generic CCL parameters (Moodley, 2009) indicated that a large proportion of subjects of Black and Coloured ethnicity experienced poor CCL fitting due to the lack of CCLs with appropriate lens parameters suitable for these patients. This implied that the relatively high proportion of Coloured (11.3%) as well as Black ethnicity wearers in this study, were at risk of compromised ocular health and were most likely wearing CCLs that compromised their ocular health. Although this aspect was not specifically addressed by the present study, it was revealed during the interview with participant 3.17, who stated:

> *I used to wear my lens every day because my specs were broken. I have not had any infections but when I wore the lens for too long, then my eyes were irritated and I noticed that my veins would expand and I have to take my lens out. That's the only problem I have with my lenses.*

This participant was a prescription CCL wearer of Coloured ethnicity, who described the experience of a tight lens fit. She furthermore described negative follow-up and care engagements with her optometrist. Tight lens syndrome has been associated with the provision of contact lenses without proper fitting or follow-up care (Steinemann, et al., 2003).

b) Potential for Harm by CCLs

As demonstrated by Figure 4.22, participants disagreed with the concept that CCLs were harmless to the eyes due to their cosmetic nature. However, there was a great deal of uncertainty as to whether CCLs posed the same risk to the eyes as prescription lenses. This suggested that participants either believed that CCLs were harmless, or that they were unsure if harm could occur from contact lens wear at all. It may also be that this uncertain response resulted from the unclear phrasing of the statement. However, the majority of wearers demonstrated the belief that CCL care was equivalent to prescription contact lens care. Therefore, if these wearers are provided with the appropriate education by their respective practitioners, they will more likely exercise compliance in lens care procedures.

CCL material has been linked to MK (Evans & Fleiszig, 2013). CCL lens material has been criticised by ophthalmic professionals as being outdated and unhealthy (Morgan & Efron, 2009). Recently, CCLs have been made available in silicone hydrogel material (Alcon , 2014). This demonstrated an effort by manufacturers to reduce the risk of ocular damage by offering CCL wearers a lens with improved oxygen permeability.

c) Cost sensitivity

On the subject of cost, the study revealed that procurement and use of CCLs by cost-sensitive individuals was related to negative behaviours such as wearing lenses beyond their scheduled disposal period. These and other unhygienic practices were described by Singh *et al* (2012), who suggested that wearers who were sensitive to cost and other socio-economic factors, were more likely to engage in unhygienic behaviours.

Four wearers made reference to the expense of the CCLs. Interviewee 8.09 indicated cost as one of his reasons for discontinuing CCL wear, while 7.01 stated that she used the Expressions brand of lenses despite cost, but did indicate that she wore the lenses for two months. Interviewee 3.17 confessed that she too wore her lenses beyond the scheduled disposal period due to cost, and 7.26 stated that she considered the expense of procuring CCLs from an optometric practice excessive, and would consider obtaining her next pair of lenses from a source who could provide them at a discounted rate.

Cost sensitivity was therefore considered as a contributor to high-risk behaviours with CCLs. For wearers who held to the belief that CCLs were not harmful and were merely cosmetic devices, the issue of affordability took precedence over quality. Cost was identified as a significant factor in the procurement of CCLs. This pertained not only to the selection of vendor, but also to the pre-trial examination, follow-up and maintenance of CCLs. It is important that the public be educated that a contact lens is a clinical device that has to be managed with the corresponding clinical care.

5.3.4 Wearer Behaviours

a) Hygiene and Non-compliant Practices

The findings displayed in Table 4.18 suggested that CCL-aware participants in general tended to avoid overt high risk behaviours of sharing lenses, sleeping in lenses and using saliva to clean lenses. However, participants demonstrated a high degree of uncertainty towards exposure of lenses to tap water, and to a lesser extent, the need for special cleaning solutions. The danger of exposing lenses to water has been documented as a serious risk for acanthamoeba keratitis (Lee, et al., 2007). This finding therefore demonstrates an awareness gap amongst students.

Numerous studies have reported on the consequences of unhygienic and non-compliant behaviour relating to CCL usage. The practice of sharing lenses as reported by both an Indian (Singh, et al., 2012) and a French study (Sauer & Bourcier, 2011), has demonstrated a high risk for MK. Evidence of this was reported by a wearer (4.01) recruited into the interview phase.

Wearers demonstrated awareness that overnight wear was a harmful practice, with few wearers admitting to this practice.

b) Discontinuation of CCL wear

It was found that the concept of ocular and visual discomfort was not tolerated by the study population in favour of CCL wear (Figure 4.20). Wearers however, displayed a marginally more tolerant attitude towards ocular and visual discomfort, although this effect may be explained by the smaller sample size. A high proportion of discontinuation was demonstrated amongst wearers as summarised in Table 4.24: QUAL Inventory of Wearer Procurement and Usage Practices.

This may be due to patients wearing lenses that did not fit properly or as a result of other contact lenses complications. Hence it is important that patients return to their optometrists for routine after care visits to enable them to conduct a clinical assessment and remedy any presenting complication. Proper fitting procedure and follow up visits could potentially limit the drop-out rate with contact lens wearers. Bui *et.al* reported that ocular discomfort in contact lens wear is a leading

cause of discontinuation of lens wear (Bui, et al., 2010). Ocular discomfort may result from the lens material or method of incorporating pigment onto the lens (Chan, et al., 2013).

5.3.5 Predicting usage behaviour by procurement practices

Making use of the optometrist as procurement source alone, was not able to predict safe usage practices amongst wearers. This was demonstrated in a study on MK, which described sourcing from an "optical shop" without prescription or fitting (Singh, et al., 2012). Less than 50% of the interviewees who obtained CCLs from optometric sources indicated that the appropriate clinical protocols were observed during CCL procurement. Steinemann *et al* in their authoritative publication (Steinemann, et al., 2005), stated that all contact lenses, including CCLs were medical devices that required the expertise of an eye care professional in the appropriate patient screening, fitting, education and follow-up care.
A meta-analysis of studies on CCL safety (Raj, et al., 2013) confirmed that patients, when properly fitted, instructed and provided with appropriate aftercare, were able to enjoy safe and effective CCL use. Participant 6.23 displayed a healthy approach to CCL usage with safe scheduled disposal practices. These appeared to be linked to her reliance on instruction and guidance from ophthalmic professionals.

It may therefore be stated that safe usage practices have demonstrated a relationship with regulated procurement practices.

5.3.6 Responsibility of Optometrists

It has been found, both in this study and others (Raj, et al., 2013), that CCLs, when procured safely and responsibly, under the care of a competent optometrist, may be used in a safe and healthy manner. Optometrists have a professional responsibility to provide the public with safe eye care. As concluded by Moodley, optometrists are legally and ethically obligated to desist from any unsafe practices in providing CCLs to the public (Moodley, 2009).

Noting that the practice of secondary procurement exists, it reinforces the fact that the burden of care is on the optometrist who prescribes CCLs (South African National Department of Health, 2007) to ensure that the lenses are appropriately handled, maintained and replaced or discarded of according to a prescribed schedule (HPCSA, n.d.) In addition, the onus is on each optometrist conducting optometric examinations to ensure that they conduct a comprehensive case history, as well as an optometric examination which meets the minimum standard of optometric care as stipulated by the Health Professions Council of South Africa, so as not to miss occasional CCL wearers who may have procured lenses from other sources.

5.3.7 Role of Statutory and Regulatory Authorities

Statutory and regulatory bodies governing the control of CCLs to the public should remain vigilant to the onslaught of unregulated distribution of CCLs; both at a legislative level, as was successfully achieved in April 2007 (South African National Department of Health, 2007), as well at the level of regular public engagement on the genuine dangers posed by CCLs procured by unregulated means. An ongoing public information campaign has been successfully conducted by the United States government via the Food and Drug Administration (FDA) (FDA: US Department of Health and Human Services, 2006). The success of this campaign was described in a recent publication, stating that regulations instituted in 2006 had alleviated the severity of complications related to CCL wear (Young, et al., 2014)

CHAPTER 6: CONCLUSION

6.1 INTRODUCTION

There was sufficient evidence generated by this study to support hypothesis that students who procured CCLs by unregulated means exhibited negative usage practices. In addition, the findings answered the research questions which sought to determine the extent of CCL exposure in the study population and the CCL procurement and usage practices in which wearers engaged.

6.2 SUMMARY OF THE STUDY FINDINGS

The findings obtained in this study revealed a CCL exposure level of just under 50%. A 7% wearer prevalence was found, which marginally exceeded the reported prevalence in international studies. An additional 15% in the study sample indicated that they would consider CCL wear in future.

Optometric procurement was selected in preference to unregulated procurement by the majority of study participants. Although this was initially viewed as a positive and healthy trend, wearers described various inadequacies in optometric procurement practices, which seemed to reinforce the perception held by some wearers that CCLs need not be procured from a regulated source. The study findings were in agreement with anecdotal local reports of irresponsible optometric distribution of CCLs.

The findings suggested that unhygienic and non-compliant practices such as CCL over wear resulted from the incorrect belief that CCLs could not cause harm to the eye. These practices were enabled by a lack of rigour in procurement practices, and was exacerbated by socio-economic factors.

6.3 RECOMMENDATIONS

6.3.1 Online CCL procurement

It is hoped that the timing of this study will pre-empt a potential problem of online lens procurement by advocating for stricter regulation surrounding CCL imports, as well as an improved standard of care as delivered by optometrists to CCL wearers.

6.3.2 Responsibility of optometrists

The present study has confirmed the view amongst young adults in Cape Town, South Africa, that optometrists are the custodians of CCL procurement and all that it entails. It is essential that optometry in South Africa does not sully this public confidence with profession-defeating practices.

6.3.3 Role of statutory and regulatory authorities

Statutory regulatory bodies governing the control of CCLs to the public should remain vigilant to the onslaught of unregulated distribution of CCLs at a legislative level, and professional association and other public health organizations should implement regular public engagements to create awareness on the genuine dangers posed by CCLs procured by unregulated means.

6.4 CONCLUSION

This study succeeded in its aim to describe CCL exposure, procurement and usage amongst students attending a university in South Africa. This is the first study describing CCL wearer awareness, prevalence and procurement practices in South Africa. CCL distribution remains the custodial responsibility of the optometric profession, who should ensure that this distribution occurs in a manner that promotes the ocular safety and health of the public. It is hoped that these findings are used as a basis for promoting the safe distribution and use of CCLs in Cape Town.

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APPENDICES

APPENDIX A: INFORMED CONSENT

COSMETIC CONTACT LENS PROCUREMENT AND USAGE AMONGST STUDENTS ATTENDING A UNIVERSITY IN CAPE TOWN SOUTH AFRICA

Information Sheet and Consent to Participate in Research

Date: 20 October 2014

Dear CPUT Student

My name is Angelique Hendricks from the department of Ophthalmic Sciences at the CPUT. I am conducting a research project as part of the postgraduate degree: Master of Optometry, registered at the University of KwaZulu Natal.
My physical office location is Room 003, Trafalgar Stone Building, 20 De Villiers Street, Cape Town, and my contact number is 021 4603560/3. You may also reach me by email at hendricksa@cput.ac.za.

You are being invited to consider participating in a study that involves research to determine whether you have had any experience with cosmetic (coloured/ tinted/ decorative) contact lenses (CCL's), and to explore such experiences using a questionnaire and a possible additional interview. The aim and purpose of this research is to determine how many students have used CCLs, how the CCLs were obtained and the user experiences.

The study is expected to enroll students from all Faculties at CPUT, with a desired response from 1000 students with a statistically calculated minimum response of 620 students during the first questionnaire-based phase and the recruitment of 30 students during the second phase- an interview.
The questionnaire will be self-administered and facilitated by the researcher. The interview will be arranged only for those who indicate in the questionnaire that they agree to be interviewed. These participants will be invited to meet with the researcher at the library commons of their respective campuses.

The duration of participation is expected to be 15 minutes for the questionnaire; should participants proceed to the interview stage, the duration will be between 30 and 60 minutes.

The study will not involve any risks or discomfort to participants. The study will provide no direct benefits to participants other than information on safe usage of CCLs made available to the entire CPUT student body at the end of the study. It is envisioned that this study will provide scientific insight into the extent and nature of CCL usage in a student population in Cape Town.

If any eye health concerns are identified during the study, the participant will be advised to attend the CPUT Eye Clinic or any other Eye Care Practitioner of their choosing for a complete ocular health assessment.

This study has been ethically reviewed and approved by the UKZN Biomedical research Ethics Committee (approval number BE306/14).

In the event of any problems or concerns/questions participants may contact either the researcher or the UKZN Biomedical Research Ethics Committee, contact details as follows:

RESEARCHER
Angelique Hendricks
CPUT Department of Ophthalmic Sciences
Trafalgar Stone Building
20 De Villiers Street
Cape Town
8000
Tel: 27 21 460 3560/3
Email: hendricksa@cput.ac.za

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604769 - Fax: 27 31 2604609
Email: BREC@ukzn.ac.za

Participation in this research is voluntary and participants may withdraw participation at any point. Should you refuse participation or withdraw your participation at any point, you will not be penalized in any way.

Participation in this study will be free of any cost and every effort will be made to ensure that your time will be utilized efficiently. No financial incentives or reimbursements will be given in this study.

All personal information of participants will be treated confidentially, and no participant will be individually identified in the results. All questionnaires and interview records will be stored securely, physical documents in a locked cupboard and electronic copies on a password-protected computer. The documents will be shredded/ deleted after analysis and dissemination of results- typically 5 years after the study.

CONSENT TO PARTICIPATE IN RESEARCH

I (Name_____) have been informed about the study entitled Cosmetic Contact Lens Procurement and Usage Amongst Students Attending a University in Cape Town South Africa by Ms. Angelique Hendricks.

I understand the purpose and procedures of the study are to determine whether I have used Cosmetic Contact Lenses, and if so, what my usage experience has been.

I have been given an opportunity to ask questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any treatment or care that I would usually be entitled to.

I have been informed about any available compensation or medical treatment if injury occurs to me as a result of study-related procedures.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at:

RESEARCHER
Angelique Hendricks
CPUT Department of Ophthalmic Sciences
Trafalgar Stone Building
20 De Villiers Street
Cape Town
8000
Tel: 27 21 460 3560/3
Email: hendricksa@cput.ac.za

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604769 - Fax: 27 31 2604609
Email: BREC@ukzn.ac.za

_____ _____
Signature of Participant Date

_____ _____
Signature of Witness Date
(Where applicable)

APPENDIX B: QUESTIONNAIRE

Cosmetic Contact Lens Usage Practices Amongst Students at a University in Cape Town

The following survey aims to determine your experience with Cosmetic (Colour) Contact Lenses (CCLs).

SECTION A

1. What is your gender? MALE [1] FEMALE [2]

2. What is your age? [ ]

3. What course are you studying? [ ]

4. Which of the following statements best describes your financial situation? Tick only 1 box.

I struggle to afford basic items such as food and clothing	1
I can afford most of the basic items, but not luxury goods.	2
I can afford luxury goods and extra things.	3

5. What is your eye colour? [ ]

6. What is your ethnicity? Tick only 1 box.

Black	1	White	3
Coloured	2	Indian	4
Other (Specify)			

7. In which Cape Town area do you **currently live**? [ ]

8. What is your **home province** (or home country if not South Africa)?

[ ]

9. Which of the following have you used to correct your vision? Tick all that apply.

Spectacles/ Glasses	1	Soft Contact Lenses	4
Hard Contact Lenses	2	Laser surgery	5
No vision correction worn	3	Other (specify)	

10. When was your last eye examination? Tick only 1 box.

11. Read through the following statements and select **the top 5** statements which describe you best.

I regularly change my appearance (hair, eyelashes, etcetera).	1
I like to be noticed by those around me.	2
I sometimes take risks without considering my safety.	3
I spend money on my appearance.	4
I frequently attend parties/clubs.	5
I am frequently involved in sport/health activities.	6
I am generally satisfied with my natural appearance.	7
I am very careful about keeping healthy.	8
I spend money on my health.	9
I will put up with discomfort if it means I will look good.	10
I generally follow what my friends do to be part of the crowd	11

12. Have you ever heard of cosmetic (colour) contact lenses (CCLs)?

Yes, I have heard of them.	1	Please proceed to **Section B**
I never heard of these lenses before today.	2	**Thank you for your participation.**

SECTION B

You have reached this section of the survey because you know of- or have wearing experience with CCLs.

Instruction Statement: If you were to obtain a pair of monthly disposable CCLs (licensed to be discarded after a month), please tick **your response** to each statement below.		I AGREE	I AM UNSURE	I DISAGREE
1.	"I would wear the lenses even if they irritated my eyes."	1	2	3
2.	"CCLs are less harmful to the eyes than prescription contact lenses."	1	2	3
3.	"CCLs require the same care and maintenance as prescription contact lenses"	1	2	3
4.	"I would wear CCLs even if they did not give me clear vision."	1	2	3
5.	"I would throw these CCLs away after wearing them for 1 calendar month."	1	2	3
6.	"CCLs are designed to fit anyone; an eye test is not required for CCLs."	1	2	3
7.	"Monthly disposable CCLs can be used longer if they still look and feel okay."	1	2	3
8.	"It is okay to swop used CCLs with friends."	1	2	3
9.	"I can sleep with CCLs in my eyes."	1	2	3
10.	"I need to buy special cleaning solutions to clean my CCLs."	1	2	3
11.	"I could use tap water to rinse my CCLs."	1	2	3
12.	"I could put the lens in my mouth to clean it off in an emergency."	1	2	3
13.	"CCLs cannot damage my eyes as they are only cosmetic appliances."	1	2	3

14. "I would wear the CCLs described in the **Instruction Statement**, if I got them from any of the following sources:" (Select all that apply):

A beauty shop/ salon	1	Flea market	4
A friend	2	An optometrist/ eye-care professional	5
A night club/ party promotion	3	An online/ internet purchase	6
Other (specify)			

15. "I would be guided on using the lenses described in the **Instruction Statement** by:"

getting help online (e.g. YouTube tutorial)	1
asking a friend with contact lens experience	2
seeking advice from the nearest eye-care professional	3
Other (specify)	

16. "If I developed a red, swollen eye from wearing the CCLs described in the **Instruction Statement**, I would…" (Select a maximum of 2).

use a home remedy	1	visit the nearest clinic/ GP	4
use an eye patch	2	visit the nearest eye care professional	5
buy over-the-counter eye-drops	3	get online help (e.g. Google)	6
Other (specify)			

17. What is your **personal experience** of wearing CCLs?

I have never worn CCLs and will not wear them in future	1	Thank you for your participation.
I have never worn CCLs but I may wear them in future	2	Thank you for your participation.
I have worn CCLs for a short time, but no longer wear them	3	Please proceed to **Question 18.**
I have worn CCLs a number of times.	4	Please proceed to **Question 18.**

18. Have you **ever obtained CCLs <u>without an eye examination</u>** from any of the following sources? (Select all that apply):

From an optometric practice	1	Never	3
From an online/ internet distributor	2	N/A	4
Other (specify)			

Your experience as a Cosmetic Contact Lens wearer is valuable to this study. Please provide your email address in the space below, so that you may be contacted by the researcher for a follow-up interview.

Email Address		Cellphone Number	

Thank you for your participation in this survey. If you would like more information about Cosmetic Contact Lenses, please contact the researcher, Angelique Hendricks, at hendricksa@cput.ac.za or your nearest optometric practice for sound advice.

APPENDIX C: QUALITATIVE INTERVIEW

Semi-Structured Interview Schedule

You have indicated that you have some experience in using Cosmetic (Colour) Contact Lenses (CCLs). The questions you will be asked aim to gain more understanding of how you obtain and use your lenses.

Name:

Gender:

Age:

Field of study:

Ethnicity:

Place of Origin:

Question 1: Your use of CCLs

1.1 Why did you/ do you use CCLs?

1.2 What did you enjoy about your CCLs?

1.3 What didn't you enjoy about your CCLs?

1.4 Are you still wearing CCL's? Why/ Why not?

1.5 Is there anything else you wish to discuss about your use of CCLs?

Question 2: Where you obtained your CCLs

2.1 Where did you get your CCLs (first pair and subsequent pairs)? Why did you get it from there?

2.2 Do you know of any other ways of obtaining CCLs?

2.3 Did you visit an Eye Care Practitioner (ECP) at any point during your CCL wear? For what reason? (Why/ why not?)

2.4 Do you think CCL-wear should be managed by an ECP? Why/Why not?

2.5 Is there anything else you wish to discuss about obtaining CCLs?

Question 3: Your wearing habits

3.1 What information did you receive on how to use your lenses?

3.2 How did/ do you care for your CCLs? (Cleaning, rinsing, storing, etc)

3.3 How safe do you consider your lens-wearing habits to be?
Do you believe CCLs can cause your eyes harm?

3.4 Is there anything else you wish to discuss about your wearing habits?

Thank you for your time.

APPENDIX D: CPUT GATEKEEPER PERMISSION

Cape Peninsula University of Technology

Office of the Deputy Vice-Chancellor: Academic
Cape Town Campus
P O Box 652
Cape Town
8000
Tel: 021-4603356
Fax: 021-4603983
Email: staaka@cput.ac.za

Research Office
Biomedical Research Ethics Administration
Westville Campus
Govan Mbeki Building
Private Bag X54001
Durban 4000

22 July 2014

To the Chairperson of the Biomedical Research ethics Committee of the University of KwaZulu Natal

Ms. Angelique Hendricks is a student at the University of KwaZulu-Natal and an employee at the Cape Peninsula University of Technology. Ms. Hendricks has proposed a Master's thesis project entitled "A descriptive study of cosmetic contact lens procurement and usage amongst students at a University in Cape Town, South Africa."

I am aware that her project involves recruiting students of the Cape Peninsula University of Technology and will be conducted using an online survey to recruit participants into the study.

I understand that all information collected will be done with duly informed consent from the participating students and that students may refuse participation with no negative consequences.

I support the conduct of this research at the Cape Peninsula University of Technology, provided that Ms. Hendricks obtains ethics approval from the BREC of the University of KwaZulu Natal and the Senate Ethics Committee of the Cape Peninsula University of Technology.

Yours sincerely

(Prof) Anthony Staak
Deputy Vice-Chancellor: Academic
Cape Peninsula University of Technology

Tel: +27 21 4603356
Fax: +27 21 4603983

APPENDIX E: UKZN ETHICS CLEARANCE

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

25 July 2014

Ms Angelique Hendricks
20 De Villiers Street
Cape Town
8000
hendricksa@cput.ac.za

Dear Ms Hendricks

PROTOCOL: A descriptive study of cosmetic contact lens procurement and usage amongst students at a University in Cape Town South Africa: Degree Purposes (Masters). BREC REF: BE306/14.

EXPEDITED APPLICATION

A sub-committee of the Biomedical Research Ethics Committee has considered and noted your application received on 12 June 2014.

The study was provisionally approved pending appropriate responses to queries raised. Your responses received on 23 July 2014 to queries raised on 11 July 2014 have been noted by a sub-committee of the Biomedical Research Ethics Committee. The conditions have now been met and the study is given full ethics approval and may begin as from 25 July 2014.

This approval is valid for one year from **25 July 2014**. To ensure uninterrupted approval of this study beyond the approval expiry date, an application for recertification must be submitted to BREC on the appropriate BREC form 2-3 months before the expiry date.

Any amendments to this study, unless urgently required to ensure safety of participants, must be approved by BREC prior to implementation.

Your acceptance of this approval denotes your compliance with South African National Research Ethics Guidelines (2004), South African National Good Clinical Practice Guidelines (2006) (if applicable) and with UKZN BREC ethics requirements as contained in the UKZN BREC Terms of Reference and Standard Operating Procedures, all available at http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx.

BREC is registered with the South African National Health Research Ethics Council (REC-290408-009). BREC has US Office for Human Research Protections (OHRP) Federal-wide Assurance (FWA 678).

The sub-committee's decision will be **RATIFIED** by a full Committee at its meeting taking place on 12 August 2014.

We wish you well with this study. We would appreciate receiving copies of all publications arising out of this study.

Yours sincerely

Professor D.R Wassenaar
Chair: Biomedical Research Ethics Committee

Professor D Wassenaar (Chair)
Biomedical Research Ethics Committee
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban, 4000, South Africa
Telephone: +27 (0)31 260 3587 **Facsimile:** +27 (0)31 260 4609 **Email:** brec@ukzn.ac.za
Website: http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx

Found/Fog Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

INSPIRING GREATNESS

APPENDIX F: CPUT ETHICS CLEARANCE

Cape Peninsula
University of Technology

HEALTH AND WELLNESS SCIENCES RESEARCH ETHICS COMMITTEE (HW-REC)
Registration Number NHREC: REC- 230408-014

P.O. Box 1906 • Bellville 7535 South Africa
Symphony Road Bellville 7535
•Tel: +27 21 959 6917 • Fax +27 21 953 8490
Email: lebenyat@cput.ac.za

06 October 2014
CPUT/HW-REC 2014/H06

Faculty of Health and Wellness Sciences – Ophthalmic Sciences Department

Dear Ms. Hendricks

YOUR APPLICATION TO THE HW-REC FOR ETHICAL CLEARANCE

Approval was granted by the Health and Wellness Sciences-REC on 02 October 2014 to Ms. Angelique Hendricks for ethical clearance. This approval is for research activities related to your Masters degree at the University of KwaZulu-Natal.

TITLE: A descriptive study of cosmetic contact lens procurement and usage amongst students at a University in Cape Town South Africa

SUPERVISOR: Ms. V.R. Moodley

Comment:
Approval will not extend beyond 07 October 2015. An extension should be applied for 6 weeks before this expiry date should data collection and use/analysis of data, information and/or samples for this study continue beyond this date.

The investigator(s) should understand the conditions under which they are authorized to carry out this study and they should be compliant to these conditions. **It is required that the investigator(s) complete an annual progress report that should be submitted to the HW-REC in December of that particular year, for the HW-REC to be kept informed of the progress and of any problems you may encounter.**

Kind Regards

MR. NAVINDHRA NAIDOO
CHAIRPERSON – ETHICS RESEARCH COMMITTEE
FACULTY OF HEALTH AND WELLNESS SCIENCES

APPENDIX G: HOD EMAIL INVITATION

From: Angelique Hendricks
Sent: Monday, October 20, 2014 4:15 PM
To: Angelique Hendricks
Subject: Requesting Access to Students for Research Survey

Dear Departmental Head/ Programme Coordinator

My name is Angelique Hendricks from the Ophthalmic Sciences department on the Cape Town Campus.

I am currently conducting a survey towards a Master's Degree on the use of Cosmetic Contact Lenses among students at CPUT (see attached). This study has obtained the appropriate institutional permissions from the Institutional Review Boards as well as from the DVC Academic (see attached).

Your department has been randomly selected as one of 11 student clusters to be included into the study, as it meets the criteria of having undergraduate students in full time contact class groups.

Could I kindly request your assistance in providing me with the name of a departmental contact who may be able to facilitate this 15 minute questionnaire-based survey? I will be administering the survey personally with the aid of my research assistant. Therefore my only requirement is the availability of a student group (one class group per department will suffice) at an agreed time before the end of the academic year.

I am cognizant of the timing of this survey, which is why I request that you forward this request to your nominated course contact(s) at your earliest convenience.

I thank you for your time and kind consideration of this request.

Yours sincerely

Angelique Hendricks

Department of Ophthalmic Sciences

Cape Peninsula University of Technology

Tel (w): +27 21 460 3563

Mobile: +27 83 326 9319

APPENDIX H: SAMPLE WEARER INTERVIEW

09:11, 27 Nov - Angelique Hendricks: Dear student, you recently completed a questionnaire indicating that you have worn Cosmetic Contact Lenses.

09:11, 27 Nov - Angelique Hendricks: Please would you let me know if you are able to answer a few follow up questions about your wearing experience during the course of today?

09:13, 27 Nov - Angelique Hendricks: The communication is entirely up to you and you can let me know when it would be best to contact you.

10:33, 27 Nov - Angelique Hendricks: The first thing I'd like to know is whether you got your lenses (cosmetic contact lenses) from an optometrist

13:50, 27 Nov - Angelique Hendricks: Hi there, please let me know when you would be available to respond to a few questions related to your use of Cosmetic Contact Lenses? Thanks
16:44, 27 Nov - 3 17: Hi. I'm free on Monday.

16:51, 27 Nov - Angelique Hendricks: Hi, I need to ask just a few questions- shouldn't take more than 20 minutes and we could do it over WhatsApp

16:51, 27 Nov - Angelique Hendricks: Could we chat quickly?

16:59, 27 Nov - 3 17: Yes.

17:00, 27 Nov - Angelique Hendricks: Great! Are you currently wearing CCLs or have you stopped wearing Them?

17:02, 27 Nov - 3 17: I do wear them but not as often as I used to. I used to wear them everyday but now its now and then.

17:02, 27 Nov - Angelique Hendricks: Where do you get your contact lenses, and what brand are they?

17:08, 27 Nov - 3 17: I get it from the optomerist. I dont knw ehat brand they are.

17:08, 27 Nov - 3 17: *What.

17:09, 27 Nov - Angelique Hendricks: How long have you been wearing CCLs?

17:12, 27 Nov - Angelique Hendricks: One of the aims of my study is to find out how these lenses are used. So I will ask a few questions on that...

17:13, 27 Nov - 3 17: Okay. Cool.

17:16, 27 Nov - Angelique Hendricks: Would you say that you received sufficient instruction and training from the optometrist on use and care of your lenses?

17:18, 27 Nov - 3 17: Yes.

17:18, 27 Nov - Angelique Hendricks: Or are there still issues you feel unsure about?

17:19, 27 Nov - Angelique Hendricks: Does your optometrist arrange follow up visits within 1 year of you receiving your lenses?

17:20, 27 Nov - 3 17: No. Are they suppose to?

17:21, 27 Nov - 3 17: They just give me me lens and I go back when I need new lens.

17:23, 27 Nov - Angelique Hendricks: Yes, regular ocular health exams for contact lens wearers can identify corneal problems before permanent damage occurs

17:24, 27 Nov - Angelique Hendricks: Follow up visits are necessary within the first week of wear for a new lens wearer and ideally every 6 months for an existing wearer.

17:26, 27 Nov - Angelique Hendricks: Do you feel confident that you are using your lens in a way that will ensure your eyes stay healthy and infection-free?

17:27, 27 Nov - Angelique Hendricks: We're you given any warnings that you can remember about handling the lenses- what not to do?

17:28, 27 Nov - Angelique Hendricks: *were

17:28, 27 Nov - 3 17: Yes.

17:29, 27 Nov - Angelique Hendricks: Sorry, I asked 2 questions... let's take the q on keeping the eye healthy

17:30, 27 Nov - Angelique Hendricks: What do you do to ensure you use the lenses in a healthy way

17:31, 27 Nov - 3 17: When cleaning the lens, be careful becos you could tear the lens. Dont sleep while you are wearing the lens, dpnt wear it for long periods of time. Just be gentle withbthe lens. Wash your hands before you put the lens in. Clean your lens and the container regular.

17:31, 27 Nov - Angelique Hendricks: Have you ever exposed your lenses to water- say when you were rinsing them?

17:32, 27 Nov - 3 17: I wash my hands before I use my lens, I dont wear them often, I clean my lens often.

17:33, 27 Nov - Angelique Hendricks: Do you ever rinse it with water?

17:33, 27 Nov - 3 17: Never. I use the soluion. The special lens cleaner.

17:33, 27 Nov - Angelique Hendricks: And how do you store the lenses?

17:33, 27 Nov - 3 17: No. I was ttold not to.

17:34, 27 Nov - Angelique Hendricks: Do you put in fresh solution

17:34, 27 Nov - Angelique Hendricks: Or do you top off the remaining solution in the case?

17:34, 27 Nov - 3 17: The container that comes with the solution.

17:35, 27 Nov - 3 17: Yes, after every use. I clean my lens before I use them and after I use them.

17:35, 27 Nov - Angelique Hendricks: How long do you wear a pair of lenses?

17:36, 27 Nov - Angelique Hendricks: Before throwing them away

17:37, 27 Nov - 3 17: While Im a student and contact lens are expensive...I was told that I could only wear it for a month...but I use it for three months. Lor longer...depends wen I can afford to buy new lens.

17:38, 27 Nov - 3 17: I was told that colour contact lens can't be worn everyday...but clear can be. Is that true?

17:40, 27 Nov - Angelique Hendricks: Colour lenses are manufactured differently, and many have rough surfaces, so that could make the lens tolerance of the wearer less

17:41, 27 Nov - Angelique Hendricks: Have you experienced any problems with your Lenses?

17:44, 27 Nov - 3 17: I used to wear my lens everyday becos my specs were broken. I have not had any infections but wen I wore lens for too long then my eyes were irrated and I noticed that my veins would expand and I have take my lens out. Thats the only problem I have with my lens.

17:45, 27 Nov - Angelique Hendricks: Ok. Did you see an optometrist about the eye reaction?

17:46, 27 Nov - 3 17: Not yet. I still need to go.

17:46, 27 Nov - 3 17: And I need new lens.

17:46, 27 Nov - Angelique Hendricks: When did this happen?

17:46, 27 Nov - Angelique Hendricks: It sounds like your colour lenses have prescription?

17:48, 27 Nov - 3 17: Yes. Its been like this for awhile.

17:48, 27 Nov - 3 17: Is it bad?

17:51, 27 Nov - Angelique Hendricks: Well, like I explained, the lens manufacturing process and materials are different for colour and clear prescription lenses

17:52, 27 Nov - Angelique Hendricks: There are new colour lenses on the market that are made with materials that are healthier for your eyes

17:53, 27 Nov - Angelique Hendricks: Please make an appointment as soon as possible to assess your eye health

17:54, 27 Nov - 3 17: Will do. Is everyday use of colour contacts bad for your eyes?

17:55, 27 Nov - Angelique Hendricks: It could be

17:56, 27 Nov - 3 17: Okay.

17:59, 27 Nov - Angelique Hendricks: For the purposes of completion of this survey, please give me the name of your course at CPUT and your residential area?

17:59, 27 Nov - 3 17: Do you have any other questions?

18:00, 27 Nov - 3 17: Journalist. Sybrand Park. Athlone.

18:00, 27 Nov - Angelique Hendricks: You have given me wonderful detail of your lens wearing experience. May I contact you again if I do have any further questions?

18:01, 27 Nov - 3 17: Ofcourse.

18:03, 27 Nov - Angelique Hendricks: Thank you so much for your time💞

18:03, 27 Nov - 3 17: Your welcome.