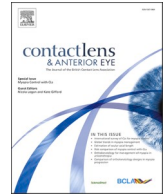




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The impact of COVID-19 on soft contact lens wear in established European and US markets

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ABSTRACT

Purpose: To characterise changes in soft contact lens wearing habits during the COVID-19 pandemic.

Methods: A detailed online questionnaire was circulated to individuals aged 40–70 years, during the period April to May 2021. Data sampling took place in the United Kingdom (UK), United States of America (USA), Netherlands, Germany, France, Spain and Italy. Only data pertaining to individuals who were soft contact lens wearers were included. Data were extracted for questions relating to contact lens wearing habits pre- and during the COVID-19 pandemic, and expectations for future lens wear beyond the pandemic.

Results: Seven-hundred and twenty-eight individuals were identified as soft contact lens wearers of which six-hundred and nineteen wore a combination of contact lenses and spectacles. Most respondents indicated contact lens wear times had either remained the same (57.3%) or increased (9.8%) during the pandemic. The country with the greatest proportion of respondents decreasing wear time during COVID-19 was the UK (45.3%), and the least in the Netherlands (20.0%). The primary cause of decreased lens wear was attributed to leaving the home less often (70.0%), and the second most common reason due to concerns about hygiene (10.8%). Most respondents (83.9%), however, expressed a desire to return to pre-pandemic wear times once the pandemic was over.

Conclusions: Practitioner concerns about contact lens market recovery ought to be assuaged by the survey outcomes which show most individuals to have maintained lens wear during the pandemic. In view of the continued lens wear, as and when restrictions ease, ECPs may wish to encourage patients to return for routine check-ups that may have been missed due to the pandemic.

1. Introduction

Since the first case was identified in December 2019, the Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) has spread globally with more than 500 million cases worldwide. Initially the high reproduction rate, compounded by a lack of effective treatments, led to a crippling demand upon many healthcare systems. A severe restriction of social interactions and movement followed. Such ‘lockdowns’ generally led to a suspension of non-urgent healthcare services, which for some regions included a halt to contact lens fittings.

The current COVID-19 status remains that of an ongoing pandemic, in the midst of which a widespread vaccination programme is underway and gradually people are returning to pre-pandemic activities. Yet, in some parts of the world, current circumstances bears little resemblance

to pre-pandemic life. Use of personal protective wear, such as face masks, remains commonplace; health care practitioners are required to adapt practices by observing periods of ‘fallow’ time between patients following any potential aerosol generating procedures (e.g., non-contact tonometry); and despite the reopening of most health services, the threat of new disease variants continues to pose a risk of future lockdowns.

The impact of the COVID-19 pandemic on the optical industry has largely manifested itself through negative economic effects; delayed diagnoses and treatments for patients; and a reported increase in conditions such as ‘quarantine myopia’, digital eye strain, and Mask Associated Dry Eye (MADE) [1–4]. Such challenges have also provided the impetus for change, embodied by the rapid development of new care pathways [5–7], a willingness to embrace telehealth [8–11], and the adaptable response demonstrated by professional regulatory bodies.

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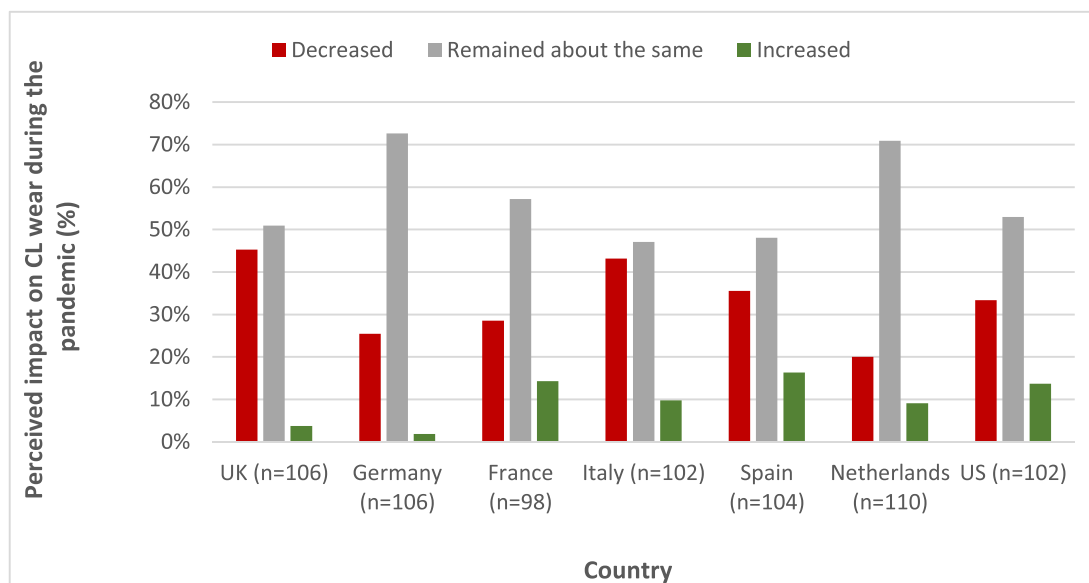


Fig. 1. Respondent perception of whether contact lens wear had increased, decreased, or remained the same during the pandemic (n = 728); individuals who wore a combination of spectacles and contact lenses (n = 619) and those who exclusively wore contact lenses (n = 109).

Suffice to say it has been a period of swift and significant transformation.

Amid the initial rush to provide advice, one aspect of the optical industry which suffered from misinformation early in the pandemic was the field of contact lenses. Both general media outlets and public health messaging contributed to erroneous messages dissuading patients from contact lens wear [12–14]. Whether such well-meant but misplaced cautionary messages had a significant influence on contact lens uptake, or if counter health advice managed to placate concerns, remains unknown [15–18].

The contact lens industry is estimated to be worth more than sixteen billion US dollars globally, with the USA being the largest contributor, hence a small reduction in global contact lens wear can yield significant economic effects [19]. At present, the impact of the pandemic on contact lens wear has only been assessed for specific countries, with little comparative worldwide data (e.g. [16,20–21]). Given the different rates at which COVID-19 spread within countries, differences in the duration of lockdowns, disparities in public messaging, and indeed, the availability and adaptability of optical services, it is of interest to characterise the impact of the pandemic on contact lens wear in different geographical regions.

Using data acquired through robust market research methods, an analysis is presented of the attitudes and soft lens wearing trends pre- and during the COVID-19 pandemic. The objective of the analysis was to better understand the short-term impact of the pandemic as well as gather information towards future market directions. Such information should facilitate future resource allocation and help business planning for practitioners, regulatory bodies, and manufacturers.

2. Methods

A detailed non-validated online questionnaire was circulated to individuals aged 40–70 years, during the period April to May 2021 to evaluate the views of presbyopic contact lens wearers and individuals interested in lens wear. The project was commissioned by Menicon Co., Ltd and undertaken by an international market research agency. This work complied with the Code of Conduct for Responsible Market Research. Data sampling took place in the following countries: United Kingdom (UK), United States of America (USA), Netherlands, Germany, France, Spain and Italy. The intention was to include an equal ratio of contact lens users and non-users. All aspects of the questionnaire were translated by a professional translation company and efforts were made

to use commonly understood terminology.

The questionnaire took approximately 15 min to complete.

Only data pertaining to individuals who were active soft contact lens wearers or had expressed an interest in wearing contact lenses were included in this analysis.

From the broader 5-part 32 question questionnaire, data were extracted for questions relating to general demographics, contact lens wearing habits pre- and during the COVID-19 pandemic, and expectations for future post pandemic lens wear.

3. Results demographics

Of the 6,465 survey respondents, 2,859 did not require any form of vision correction. 2,066 of the remaining 3,606 respondents were neither contact lens users nor did they express interest in future contact lens use.

The remaining 1,540 respondents were spread approximately equally amongst the seven countries (ranging from 215 to 223 respondents per country).

From this 1,540, 728 were soft contact lens wearers, with 109 wearers claiming to exclusively wear contact lenses, the remaining 619 wore some combination of contact lenses and spectacles.

The rest either exclusively wore spectacles (n = 758), some other form of contact lens (n = 14), or a combination of both (n = 40). Of the soft lens wearers, 39.4% wore daily disposables; 47.8% wore daily wear reusables; and 12.8% wore extended wear lenses.

The present study focusses on individuals wearing a combination of spectacles and soft contact lenses (n = 619) and those who exclusively wore contact lenses (n = 109). One point of note was the spread of age groups across the different countries; the data from the Netherlands was biased towards the younger (40–54 year old) participants.

3.1. Perceived change in contact lens wear

Whilst one-third (33.3%, n = 240) of respondents felt their contact lens wear had decreased during the pandemic, over half indicated it had remained the same (57.3%) (see Fig. 1). The greatest perceived decrease in wear was noted for respondents based in the UK (45.3%) and the least for those based in the Netherlands (20%) (see Fig. 1). In Germany and the Netherlands, more than 70% of respondents indicated they had continued with similar contact lens wearing times during the pandemic.

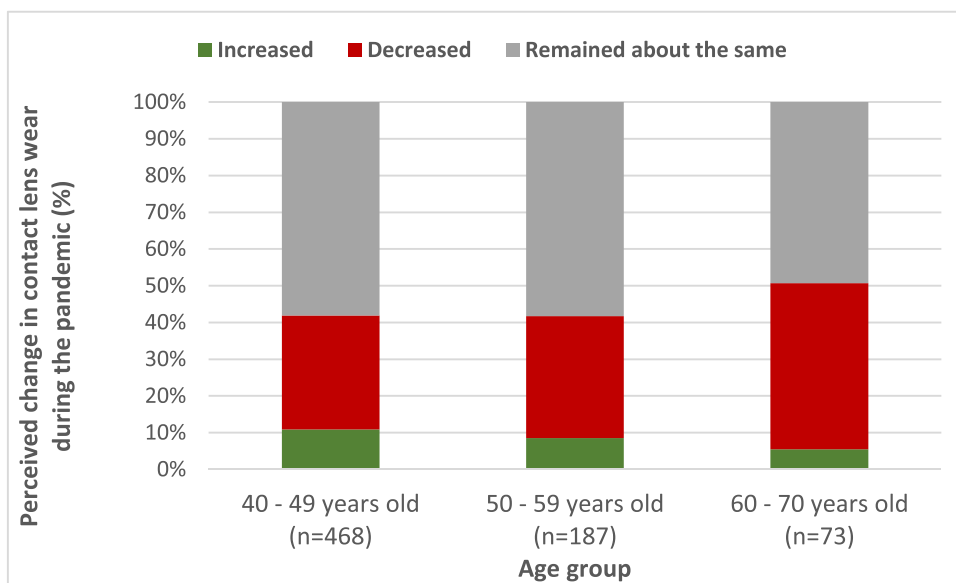


Fig. 2. Respondent perception of whether contact lens wear had increased, decreased, or remained the same during the pandemic (n = 728); data for individuals who habitually wore a combination of spectacles and contact lenses and those who exclusively wore contact lenses.

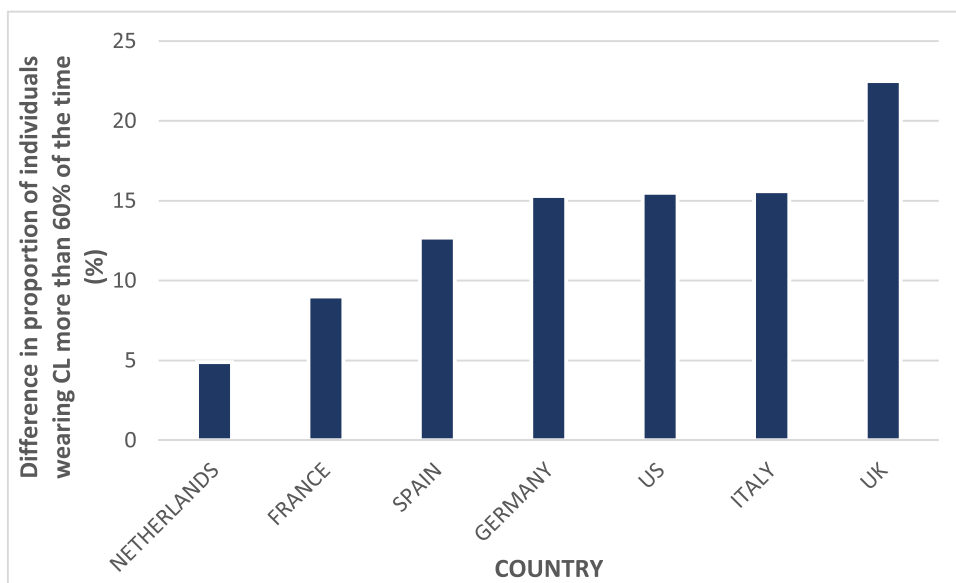


Fig. 3. Country specific data for the decline in proportion of respondents wearing contact lenses for at least 60% of the time, pre and during the COVID-19 pandemic (n = 619); data for individuals who wore a combination of spectacles and contact lenses only.

Of interest are potential differences in contact lens wear, during the pandemic, across different age groups. A larger proportion of participants aged 60–70 years old tended to decrease contact lens wear, and appeared less inclined to increase it, relative to their younger counterparts (see Fig. 2).

3.2. Pre- and during pandemic changes to spec vs. contact lens wearing balance

The overall proportion of global respondents wearing contact lenses for at least 60% of the time was 59.3% (n = 367/619) pre-pandemic, reducing to 45.4% during the pandemic. The greatest differences for this specific metric were found amongst respondents from the UK and the lowest for the Netherlands (see Fig. 3). The balance between contact lens vs. spectacle wear on a typical day pre- and during the pandemic also showed trends by age, with the greatest shift to spectacle-only wear

found amongst the 60–70-year-old age group (see Fig. 4). These data do not include 109 individuals who claimed to exclusively wear contact lenses. The data are presented with the caveat that participants from regions such as the Netherlands were predominantly drawn from younger age groups.

3.3. Reasons for change in contact lens wear

The overwhelming majority of respondents indicated the reason for reduction in contact lens wear during the pandemic was due to leaving the house less often (70%) (see Fig. 5); this remained the most common reason even when individual country data were considered, however other inter-country differences amongst reasons for reduced wear were noted.

Whilst adoption of a cautious approach due to hygiene was, on average, the second most popular reason for reducing contact lens wear,

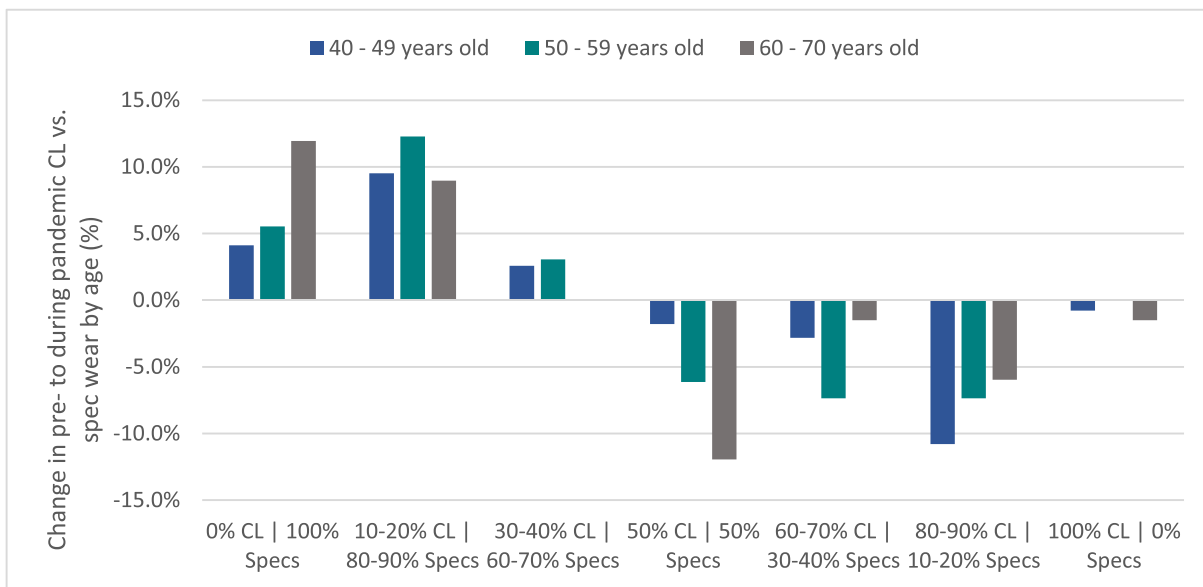


Fig. 4. Global age group data for the change in proportion of respondents wearing contact lenses vs. spectacles, pre and during the COVID-19 pandemic (n = 619); data for individuals wearing a combination of spectacles and contact lenses. Positive/negative values denote the relative increase/decrease in balance of CL vs. spec wear.

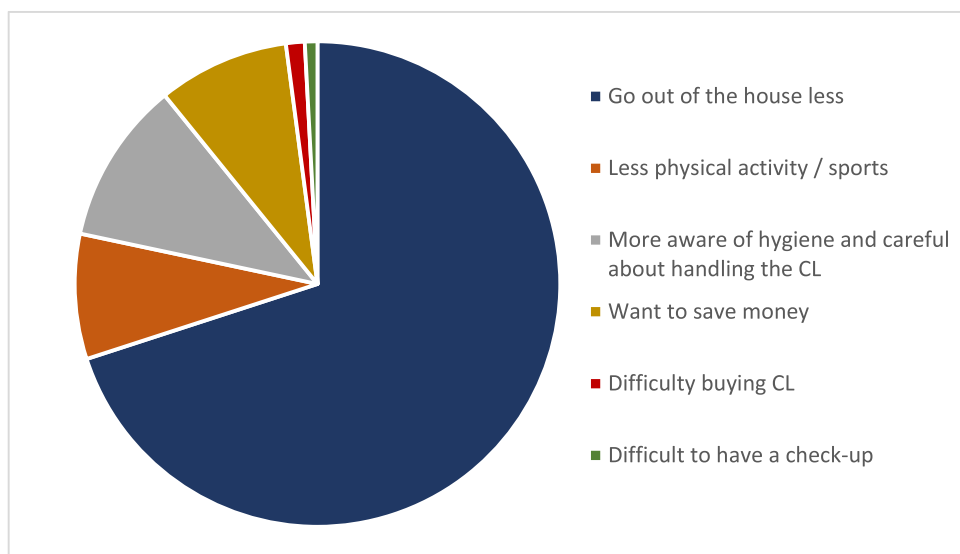


Fig. 5. Main reason for reducing contact lens wear during the pandemic from all respondents (n = 240).

such responses were proportionately much lower (10.8%) (see Fig. 6).

3.4. Expectations for contact lens wear post pandemic

Over 80% of respondents, on average, felt their contact lens usage would return to pre-pandemic levels (n = 261 of 311 respondents); whilst this sentiment was also expressed across the country specific data, notably almost one-third of respondents from France felt they would maintain the level of contact lens usage adopted during the pandemic (n = 13 of 42 respondents).

When taking into consideration whether the respondents had indicated an increase or decrease in contact lens wear during the pandemic, those who had increased wear were 2.7 times more likely to indicate they would return to pre-pandemic contact lens wearing levels than not, yet those who had decreased wear were 6.7 times more likely to indicate a return to pre-pandemic levels than not.

An association appeared to be present between whether an

individual was intending to return to pre-pandemic levels of wear and country and, separately, with whether they were males/females, but less clear trends were noted with age group (see Figs. 7–9).

4. Discussion

Recent studies investigating the impact of the COVID-19 pandemic on contact lens wear have primarily focused on data collection in specific countries. The present study offers new insights characterising lens wear in seven key market areas that have regulated contact lens practice. Encouragingly, ~67% of respondents indicated that wear times had either remained the same or increased during the pandemic, however, an association between changes to wearing patterns and country was noted.

Whilst it may seem logical to attribute any reduction in lens wear to fears about hygiene or increased infection rate, this was seldom the case. Most individuals were simply leaving home less often, which minimised

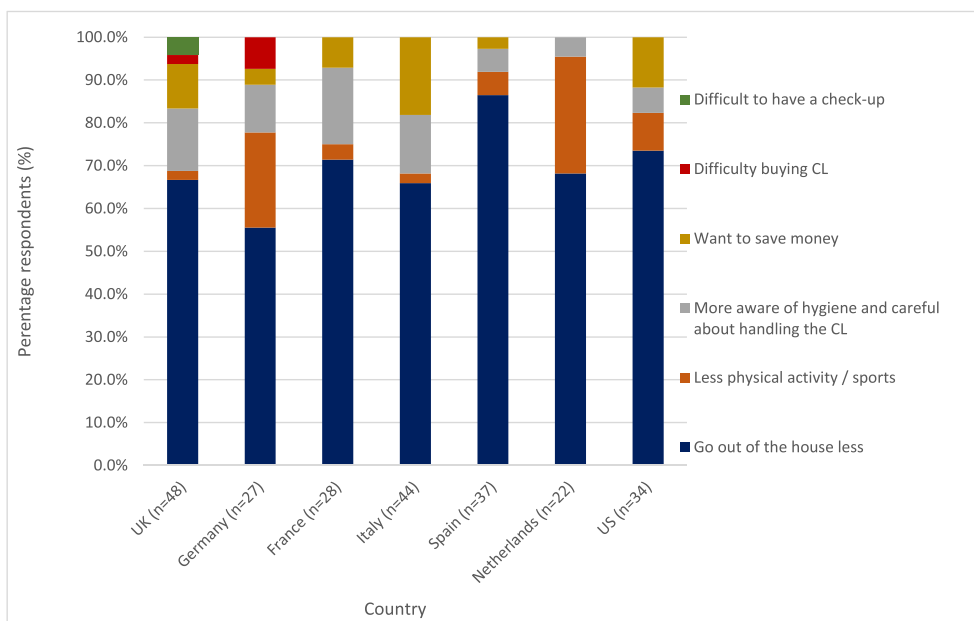


Fig. 6. Main reason for reducing contact lens wear during the pandemic from all respondents by country (n = 240).

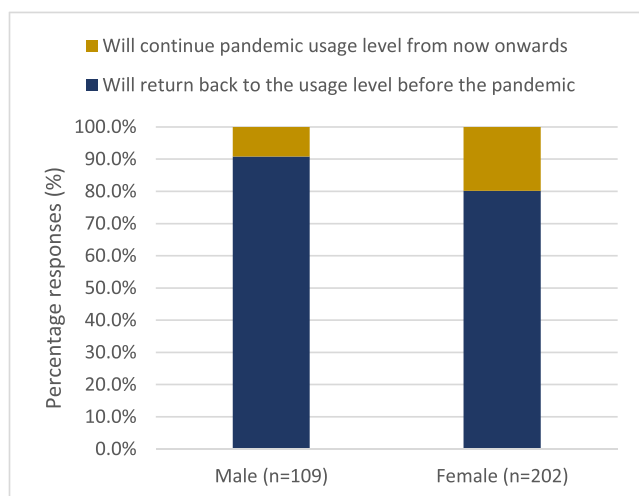


Fig. 7. Future contact lens wearing intent amongst males and females.

the need to wear contact lenses. The findings are generally consistent with previous reports undertaken earlier in the pandemic, in the UK, Ireland, Spain, Portugal, Greece and Jordan where a decline in social interactions and activities/leaving home were also cited as common reasons for decreasing lens wear [16;21–25;20]. Secondary concerns, however, differ both within the cohort investigated and more widely. For example, Fig. 6 shows a higher proportion of individuals from areas such as France were worried about hygiene compared to the Netherlands (17.9% vs. 4.5%). Separately, a report from Spain has found a significant relationship between participants concerned about risk of contact lens infection and those who ceased contact lens wear during the pandemic [25]. Thus, the data cannot easily be extrapolated between different regions/countries.

The trend for older individuals to reduce contact lens wear is likely explained by the longer lockdown periods, and thus fewer in-person interactions, to which older population groups were exposed. These data are, however, presented with the caveat that owing to the smaller number of older respondents caution must be applied when interpreting results (Figs. 2 and 4).

4.1. The future

In the near future, a multitude of factors could influence eye care practice and demand for services [26,27]. An indication that many respondents who decreased lens wear during the pandemic also expressed a desire to return to pre-pandemic wearing levels, offers a positive signal to those concerned about market recovery prospects [25].

Concerns about contact lens attrition aside, for individuals who continued wearing lenses through the pandemic the possibility of non-compliance and exposure to avoidable risks may have given rise to complications. There have been mixed reports on the efforts made by practitioners to communicate contact lens wearing advice since the pandemic began [25,22]. While some investigations have reported high levels of adherence to aspects of compliance during the pandemic e.g., better handwashing, others have noted a decline, particularly amongst individuals wearing reusable contact lenses [28,22]. A pre-pandemic study of over two-hundred asymptomatic soft lens wearers found more than half of the participants to exhibit at least one undiagnosed complication when presenting for a routine check-up. In most cases the complication related to the anterior eye or contact lenses [29]. Thus, as always, an absence of symptoms does not imply an absence of complications. Such reports support the need for ECPs to take a proactive approach and encourage patients, even if asymptomatic, to attend for face-to-face routine follow ups.

Further demand for services could arise from patients seeking help for symptoms experienced during the pandemic, e.g., an exacerbation of digital eye strain or dry eye syndromes such as MADE [23]. Patients who continue to harbour concerns about hygiene may be tempted to avoid regular replacement lenses in favour of daily disposables [25], and those frustrated by mask induced fogging of spectacles [30]) could perhaps be more motivated to embrace contact lenses. The easing of lockdown restrictions also allows activities favouring contact lens use to recommence which could potentially increase uptake. Of course, such forecasts are speculative, but the potential for new opportunities, coupled with widespread vaccine uptake should facilitate recovery of the contact lens industry.

The data presented are not without limitations; most surveys are subject to recall-bias, but the claims by respondents that lens wear times were reduced due to fewer social interactions is a point indirectly supported by data on initial lockdown durations. Of the countries

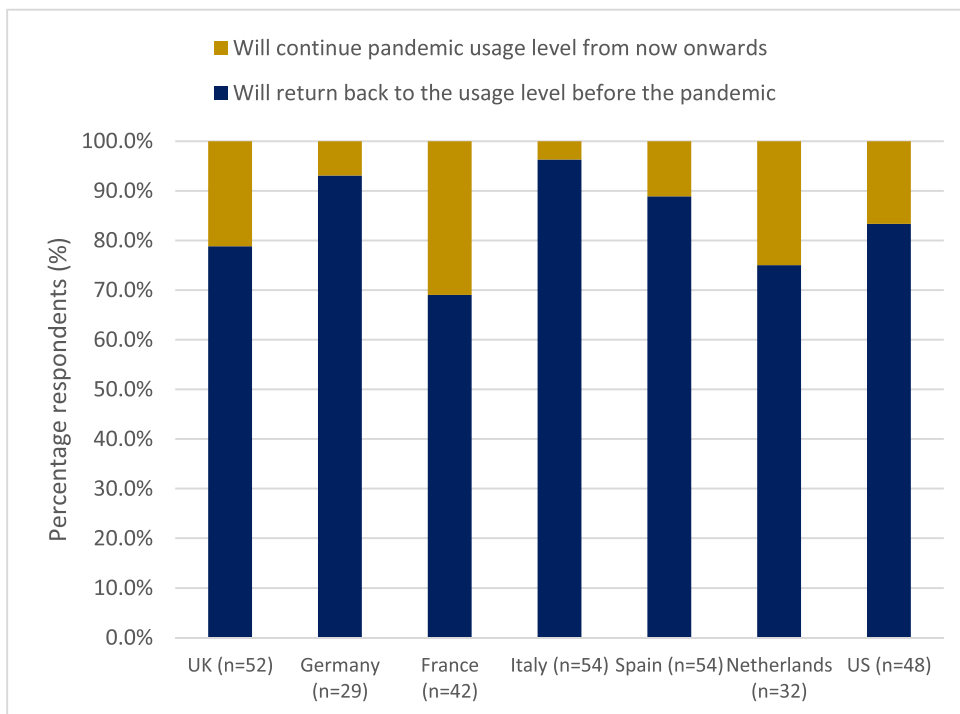


Fig. 8. Future contact lens wearing intent by country.

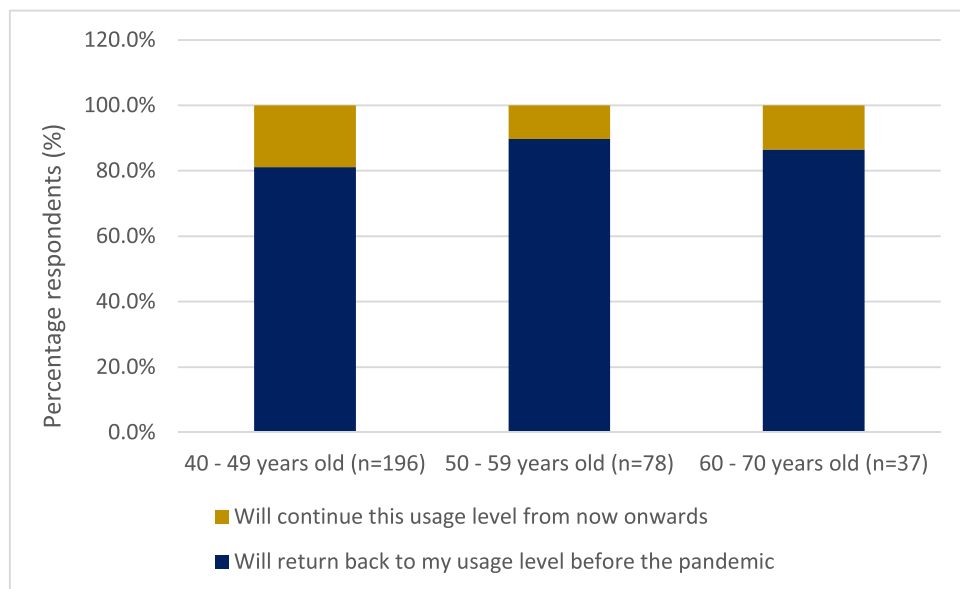


Fig. 9. Future wearing intent by age group.

investigated, parts of the UK were exposed to the longest initial lockdown, whereas the initial lockdown period in the Netherlands was comparatively much shorter. As noted in the results, data from the Netherlands was biased towards individuals who were younger, and this may have impacted some of the responses. A further limitation is that data are restricted to individuals aged 40–70 years. The inclusion of a younger cohort may have proven a useful comparator, since they were typically considered to be at lower risk of serious complications from COVID-19 and thus were subject to fewer lockdown restrictions, their inclusion may have offered an even more optimistic outlook for the contact lens industry.

In summary, global contact lens wear times reduced for around one-

third of respondents during the pandemic, a reduced need to leave home was consistently cited as the key reason for this reduction. Whilst some respondents may have been less inclined to maintain their level of contact lens wear during the pandemic, there is strong indication that many individuals are hopeful about returning to pre-pandemic wear times.

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Declaration of Competing Interest

Neil Retailic is an employee of Menicon Co. Ltd.

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References

- [1] Chang P, Zhang B, Lin L, Chen R, Chen S, Zhao Y, Qu J. Comparison of Myopic Progression before, during, and after COVID-19 Lockdown. *Ophthalmology*. 2021 Mar 23:S0161-6420(21)00234-7. 10.1016/j.ophtha.2021.03.029. Epub ahead of print. PMID: 33771516; PMCID: PMC7986471.
- [2] Xu L, Ma Y, Yuan J, Zhang Y, Wang H, Zhang G, Tu C, Lu X, Li J, Xiong Y, Chen F, Liu X, Xue Z, Zhou M, Li WQ, Wu N, Bao J, Chen H, Lu F, Su J, Qu J; Myopic Epidemiology and Intervention Study. COVID-19 Quarantine Reveals That Behavioral Changes Have an Effect on Myopia Progression. *Ophthalmology*. 2021 Apr 14:S0161-6420(21)00257-8. 10.1016/j.ophtha.2021.04.001. Epub ahead of print. PMID: 33857574.
- [3] Usgaonkar U, Shet Parkar SR, Shetty A. Impact of the use of digital devices on eyes during the lockdown period of COVID-19 pandemic. *Indian J Ophthalmol* 2021;69 (7):1901–6. https://doi.org/10.4103/ijjo.IJO_3500_20. PMID: 34146054.
- [4] Boccardo L. Self-reported symptoms of mask-associated dry eye: a survey study of 3,605 people. *Contact Lens and Anterior Eye* 2022;45(2):101408.
- [5] Zeri F, Naroo SA. Contact lens practice in the time of COVID-19. *Contact Lens Anterior Eye* 2020;43(3):193–5.
- [6] Harper RA, Dhawahir-Scala F, Wilson H, Gunn PJG, Jinkinson M, Pretty IA, et al. Development and implementation of a greater manchester COVID19 urgent eyecare service. *Eye* 2021;35(3):705–8.
- [7] Kanabar R, Craven W, Wilson H, Rietdyke R, Dhawahir-Scala F, Jinkinson M, et al. Evaluation of the Manchester COVID-19 Urgent Eyecare Service (CUES). *Eye* 2022; 36(4):850–8.
- [8] Nagra M, Vianya-Estopa M, Wolffsohn JS. Could telehealth help eye care practitioners adapt contact lens services during the COVID-19 pandemic? *Contact Lens Anterior Eye* 2020;43(3):204–7.
- [9] Patel A, Fothergill AS, Barnard KEC, Dunbar H, Crossland MD. Lockdown low vision assessment: an audit of 500 telephone-based modified low vision consultations. *Ophthalmic Physiol Optic* 2021;41(2):295–300.
- [10] Keilty M, Houston KE, Collins C, Trehan R, Chen Y-T, Merabet L, et al. Inpatient virtual vision clinic improves access to vision rehabilitation before and during the COVID-19 pandemic. *Arch Rehabil Res Clin Transl* 2021;3(1):100100.
- [11] K Karthikeyan S, Nandagopal P, R VS, Nayak A. Challenges and impact of COVID-19 lockdown on Indian optometry practice: A survey-based study. *J Optom*. 2020 Dec 26:S1888-4296(20)30133-3. 10.1016/j.optom.2020.10.006. Epub ahead of print. PMID: 33414101; PMCID: PMC7762711.
- [12] American Academy of Ophthalmology, Eyecare during COVID-19, <https://www.aaopt.org/eye-health/tips-prevention/coronavirus-covid19-eye-infection-pinkeye> [ACCESSSED AUG 22, 2021].
- [13] CNN, <https://edition.cnn.com/2020/03/27/health/contact-lens-glasses-coronavirus-wellness/index.html> [ACCESSSED AUG 22, 2021].
- [14] WebMD, <https://www.webmd.com/lung/news/20200423/how-contact-lenses-affect-your-risk-of-covid-19> [ACCESSSED AUG 22, 2021].
- [15] Cho P, Boost M. COVID 19—An eye on the virus. *Contact Lens and Anterior Eye* 2020;43(4):313–4.
- [16] Bakkar MB. Contact lens wear during the COVID-19 pandemic. *Contact Lens Anterior Eye* 2020;43(3):213.
- [17] Orsborn G. The importance of credible information about contact lens wear during pandemic. *Contact Lens Anterior Eye* 2020;43(3):214–5.
- [18] Jones L, Walsh K, Willcox M, Morgan P, Nichols J. The COVID-19 pandemic: Important considerations for contact lens practitioners. *Contact Lens Anterior Eye* 2020;43(3):196–203.
- [19] Statista, <https://www.statista.com/outlook/cmo/eyewear/contact-lenses/worldwide> [ACCESSSED AUG 23, 2021].
- [20] Bakkar MM, Alzghoul EA. Assessment of contact lens wearers' attitude toward contact lens wear and care during Coronavirus Disease 2019 (COVID-19) pandemic: a cross-sectional online survey. *Contact Lens Anterior Eye* 2021;44(6):101410.
- [21] Vianya-Estopa M, Garcia-Porta N, Piñero DP, Simo Mannion L, Beukes EW, Wolffsohn JS, et al. Contact lens wear and care in Spain during the COVID-19 pandemic. *Contact Lens Anterior Eye* 2021;44(5):101381.
- [22] Cardona G, Alonso S, Busquets A. Patient – practitioner communication and contact lens compliance during a prolonged COVID-19 lockdown. *Contact Lens Anterior Eye* 2021;44(6):101433.
- [23] Martinez-Perez C, Monteiro B, Soares M, Portugues F, Matos S, Ferreira A, et al. Influence of Face Masks on the Use of Contact Lenses. *Int J Environ Res Public Health* 2021;18(14):7407. <https://doi.org/10.3390/ijerph18147407>. PMID: 34299865; PMCID: PMC8303769.
- [24] Tzamouranis DD, Chandrinos A. Dataset on the questionnaire-based survey of the perceived risk of COVID-19 infection and Contact lens (CL) wearers. *Data in Brief* 2021;36:107101.
- [25] García-Ayuso D, Escámez-Torrecilla M, Galindo-Romero C, Valiente-Soriano FJ, Moya-Rodríguez E, Sobrado-Calvo P, et al. Influence of the COVID-19 pandemic on contact lens wear in Spain. *Contact Lens Anterior Eye* 2021;44(3):101351.
- [26] Naroo SA, Kapoor R, Zeri F. Times they are a-changin for contact lens practice. *Contact Lens Anterior Eye* 2021;44(3):101445.
- [27] Nagra M, Allen PM, Norgett Y, Beukes E, Bowen M, Vianya-Estopa M. The effect of the COVID-19 pandemic on working practices of UK primary care optometrists. *Ophthalmic Physiol Optic* 2021;41(2):378–92.
- [28] Vianya-Estopa M, Wolffsohn JS, Beukes E, Trott M, Smith L, Allen PM. Soft contact lens wearers' compliance during the COVID-19 pandemic. *Contact Lens Anterior Eye* 2021;44(4):101359.
- [29] Chen EY, Myung Lee E, Loc-Nguyen A, Frank LA, Parsons Malloy J, Weissman BA. Value of routine evaluation in asymptomatic soft contact lens wearers. *Cont Lens Anterior Eye* 2020 Oct;43(5):484–8. <https://doi.org/10.1016/j.clae.2020.02.014>. Epub 2020 Mar 4 PMID: 32146118.
- [30] Bhardwaj A, Sharma C, Rajan M B. Simple solutions for the fogging of spectacles when wearing surgical masks. *J Am Acad Dermatol*. 2020 Aug 14:S0190-9622(20)32432-4. 10.1016/j.jaad.2020.08.041. Epub ahead of print. PMID: 32805291; PMCID: PMC7427617.