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Why do people drive when they can't see clearly?

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ABSTRACT

Purpose: Refractive blur is associated with decreased hazard perception and impairments in driving performance, but little is known about why people who have spectacles to correct their distance vision drive with uncorrected vision.
Methods: We conducted six focus groups. Participants were 30 drivers (mean age 45) who reported having driven uncorrected at least twice in the past six months despite having spectacles to correct their distance vision. Focus groups were audio recorded, transcribed verbatim and analysed thematically.
Results: We identified three themes. 1. *Responsibility*: participants did not feel obliged to drive with optimal vision and believed that others have a responsibility to ensure drivers maintain clear vision. 2. *Safe Enough:* participants felt safe to drive uncorrected, did not believe they need to wear spectacles to see sufficiently clearly and that they would *know* if their uncorrected eyesight fails to meet minimum standards. 3. *Situations:* participants discussed how they would drive uncorrected for short and familiar journeys, when they feel alert, in daylight and in good weather.
Conclusions: Beliefs about the importance of driving with clear vision compete with the benefits of not wearing spectacles. Eyecare professionals should provide more direct advice to patients regarding the need to wear their visual correction for driving.
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1. Introduction

Uncorrected refractive error is the leading cause of reversible visual impairment worldwide (Van Newkirk et al., 2001). The detrimental effects of optical blur on standard clinical measures, such as visual acuity, are well known. However, functional measures such as reading (Chung, Jarvis, & Cheung, 2007), balance control (Anand, Buckley, Scally, & Elliott, 2003), quality of life, (Rahi, Peckham, & Cumberland, 2008) and driving have also been shown to be negatively impacted in the presence of optical blur that may arise from uncorrected or under corrected refractive error.

The impact of optical blur on driving has received increasing attention, given the potential ramifications for driving ability and safety. While the impact of uncorrected vision on crash risk is unknown, Sagberg (2006) reported that being myopic increased the risk of crash involvement (odds ratio 1.22, 95% confidence intervals 1.02–1.38) and suggested that this was due to insufficient optical correction, which would lead to distance blur. Simulator and closed-road driving studies indicate that while steering accuracy and lane-keeping are relatively robust to even high levels of blur (Brooks, Tyrrell, & Frank, 2005; Owens & Tyrrell, 1999), recognition of night-time road signs, low contrast hazards and pedestrians can be negatively affected

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by blur and following refractive surgery (Schallhorn, Tanzer, Kaupp, Brown, & Malady, 2009; Schallhorn et al., 2010; Wood, Marszalek, Carberry, Lacherez, & Collins, 2015; Wood et al., 2012). Even low levels of refractive blur increase the time it takes for drivers to recognise pedestrians at night (Wood et al., 2015) and the effects of blur are more marked for night compared to daytime driving performance (Wood et al., 2014). Eye movement studies have provided some insight into how these effects manifest. Drivers with blurred vision exhibit longer reaction times because they fixate on hazards for longer before reacting, make fewer fixations on hazards, and the total duration of fixation is lower, suggesting lower visual attention on the road (Lee, Black, Lacharez, & Wood, 2016).

The potential effects of optical blur on driving ability and safety may be moderated by the level of adaptation an individual has to a particular level of blur; people who are routinely uncorrected may not be as susceptible to blur as they will be adapted to it (Lee et al., 2016). Indeed, Owsley and McGwin (2010) discuss the lack of a clear link between visual acuity and motor vehicle collisions and how people with visual impairment are more likely to be older and to self-regulate their driving to reduce risk, e.g. avoiding situations they find more challenging. However, the link between blur and reduced driving performance is very relevant for people who usually wear spectacles but sometimes do not, and this applies to drivers of all ages. Indeed, blur has a more marked effect on the driving-related ability of younger than on older drivers in both laboratory-based and real-world measures of driving performance (Lee, Wood, & Black, 2015; Wood et al., 2015).

Given evidence suggesting the negative implications of blur or uncorrected or under-corrected refractive error on indices of driving ability and safety, it is surprising that many individuals drive with uncorrected refractive error. In one study uncorrected refractive error accounted for 80% of drivers whose vision failed to meet the legal limit for driving (Keeffe, Jin, Weih, McCarty, & Taylor, 2002), and a market research study in the UK estimated that 26% of motorists drive uncorrected (rarely, sometimes, often or always) and suggested that they have four times the crash risk of those who never drive uncorrected (Opinium, 2016). Some states provide restricted licences that highlight the need to wear glasses when driving, but this is variable across the U.S. states (http://lowvision.preventblindness.org/daily-living-2/state-vision-screening-and-standards-for-license-to-drive/). While there is a similar restriction in the UK, the restriction is rarely recorded on driving licences.

Importantly, the reasons why people might choose to drive without their spectacles given the evidence of the negative impact this potentially has on driving, especially at night, is unclear. Various models of decision making have been applied to risky driving behaviours, such as the Theory of Planned Behaviour (Ajzen, 1991) and its extended versions (e.g. Cristea, Paran, & Delhomme, 2013), Protection Motivation Theory (Rogers, 1975), and models that address willingness to engage in a risky behaviour instead of intentions (Gibbons & Gerrard, 1995). While there are some differences in the constructs used in these models they share a common framework. A behaviour is predicted by a set of beliefs that people have about: that behaviour and its consequences; what others do and others expect them to do; and their ability to undertake (or avoid) the behaviour. While cognitive models tend to treat these risk perceptions as reflective or logical, more recently the importance of context, and particularly emotions and the dynamic experience of how risky or vulnerable a person feels, has been demonstrated (Ferrer & Klein, 2015). Dual process models additionally model the effects of affective context on behaviour, and they are increasingly applied to understand risk taking in young people when the dual processes are typically modelled as cognitive control and reward/incentive processing (e.g. Steinberg, 2010). While risky driving behaviours such as speeding and using a mobile phone while driving have been studied extensively, little attention has been paid to driving with uncorrected optical blur. This study aimed to develop a better understanding of why people drive without visual correction in order to provide an evidence base to inform the design of interventions to target this behaviour and for eyecare professionals when advising patients about driving.

2. Method

2.1. Participants

Participants were 30 current drivers who reported having driven uncorrected at least twice in the past six months despite having spectacles that include correction for distance vision (either distance vision, progressive or bifocal lenses). They were recruited by a fieldwork agency, briefed to ensure that each group contained a range of ages and socio-economic groups and a balance of genders. The mean age was 45 (±12 years) and 18 were female and 12 male. Sixteen participants were myopes, seven were hyperopes and seven had a Mean Sphere Equivalent of between −0.50 and +1.00 (Table 1). Fifteen participants had a significant degree of astigmatism (≤−0.75DC) in at least one eye, with 10 having low astigmatism (−0.75 to −1.25DC), three having moderate astigmatism (−1.50 to −2.75DC), and two having high astigmatism (≤−3.00DC). The median amount

Table 1
Refractive status of participants.

MSE[a] of >−0.50 and <1.00	Myopes			Hyperopes (≥+1.00)
N = 7	N = 16			N = 7
	Low Myope (−0.50 to −2.75) N = 12	Moderate Myope (−3.00 to −5.75) N = 3	High Myope (≤−6.00) N = 1	

[a] Mean sphere equivalent.

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