The impact of choice difficulty on visual decision-making under risk

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Background
Much of human activity involves decision making under risk (DMUR), which is commonly characterised as biased. However, this perspective typically ignores perceptual and cognitive constraints on the decision maker. To highlight this issue, we examined performance in a visual DMUR task while manipulating constraints via choice difficulty.
Method
Participants observed a dot on a random walk until it disappeared behind an occluder before choosing the location and size of a 'catcher' to predict its point of re-emergence. Probability of dot catching was manipulated by varying uncertainty in the random walk. Reward/penalty points were allocated for catching/missing the dot, so the task was equivalent to DMUR with a unique optimal catcher size. By adjusting the curvature of the expected value (EV) function relating expected points to catcher size we could make it harder or easier to find the optimal choice.
Results
Choices were approximately optimal at high EV curvature but bias increased systematically as EV curvature decreased (although points scored were still comparable to the optimal agent).
Significance
These data add to a growing body of evidence that challenges characterisation of human DMUR as biased, suggesting humans perform as well as possible when unavoidable constraints are considered.

Perceived size of numerical values is influenced by their vertical positions in data visualisations

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Background:

When visualising data, different ways of displaying values can elicit different interpretations of the same information. This experiment investigated whether the choice of upper and lower values on a y-axis influences perceptions of the magnitude of plotted values, by dictating their vertical positions in a chart.

Methods:

150 participants viewed a series of data visualisations, each displaying the probability of a negative outcome occurring in a risk scenario (e.g., probability of experiencing side effects from medication). Two versions of each visualisation were presented: one with data points plotted in the upper third of the chart, and one with the same data points plotted in the bottom third.

Results:

On average, Likert scale ratings of risk probability and risk severity were higher when the same data points were plotted near the top of a chart, compared to near the bottom.

Significance:

This experiment illustrates that data points' vertical positions affect perceptions of how large or small they are, and also extends evidence of the impact of upper and lower y-axis values on evaluation of data beyond difference judgements. Data visualisation design choices, in particular those which accord with existing conventions, influence interpretation of numerical information.

Designing a digital assistant for users with visual impairment.

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In the UK, services for individuals with visual impairment (VI) are delivered by a wide range of organisations including hospital eye clinics, Social Services, charities, commercial companies and volunteer groups. Many people find these services invaluable and, if delivered effectively, these services have the potential to benefit the lives of people with VI and their carers and families, by improving independence, the practical ability to perform tasks, quality of life and mental well-being. However, not all individuals with VI access these services: some are housebound or live in remote areas, others are not psychologically ready to accept help, and others are simply unaware of what support is available. The AIVI Study is a proof-of-concept study to investigate whether support for people with VI can be provided by a "Chat-bot" (a computer based "personal assistant" that can recognise questions spoken to it, and respond verbally with accurate and informative answers).

The initial phase of the study has used an online questionnaire and semi-structured one-to-one interviews with individuals with VI, carers or family members, and rehabilitation professionals to map end-user requirements. This has included investigation of what information individuals with VI require, how they access information, and what they would want from a digital assistant. We will describe how these results will guide the design of a prototype platform.

Pupil dilation encodes the Gambler's Fallacy

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Background: Pupil dilation is thought to reflect surprise at unexpected outcomes. We investigated whether it might also encode increasing surprise at an unfolding run of the same outcome from a random process, e.g., a 5th head after 4 previous heads when flipping a coin. Finding such runs surprising is a cognitive bias known as the Gambler's Fallacy.

Methods: 24 participants observed the last coin flip in a sequence of 5 while pupil size was recorded. Over 100 trials participants saw sequences that varied in the length of the run prior to the fifth flip – from 1 (e.g., HTTH) to 4 (e.g., TTTT). Prior run length has no predictive value but believing in the Gambler's Fallacy should result in more surprise when seeing a run of length 4 continue than a run of length 1 continue.

Results: We found a significant interaction between run length and outcome (whether the run continued or alternated). Pupil dilation increased with run length, but only when the run continued (not when it alternated).

Significance: This is the first demonstration that pupil size encodes surprise at the Gambler's Fallacy and provides a new method to investigate the information processing that underpins the phenomenon.

Scope of practice of optometrists working in the Hospital Eye Service in the UK: second national survey

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Background

Optometrists play an important role in the UK Hospital Eye Service (HES) workforce in meeting demand for capacity. As the landscape in ophthalmology changes, we aim to re-evaluate optometrists' scope of practice to better inform current roles and responsibilities within the HES.

Method

A survey was disseminated to 129 optometry HES leads, including questions on: department workforce; core services; extended roles; procedures undertaken; level of autonomy; arrangements for prescribing; training and accreditation; and changes in response to COVID-19.

Results

Ninety responses were received (70% response rate) from within England (76%), Scotland (22%) and Northern Ireland (2%). In comparison to the 2015 survey, there was an increase in extended roles, with glaucoma (88%) remaining the most common, and new areas of practice in uveitis (21%) and vitreoretinal (13%) services. There was increased used of independent prescribing (67%) and an increase in optometrists delivering laser interventions. In response to COVID19, increased use of telephone consultations were key changes.

Significance

Optometrists' scope of practice continues to evolve in the HES and there has been a shift in what should now be considered as core hospital optometry services, with increased working and prescribing independently, and the delivery of procedures historically performed by doctors.

Autism and eye examination accessibility

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Significant issues surround healthcare provision to the autistic population. Although general barriers to accessing healthcare have been explored, there is no research specific to eyecare services. Autistic individuals are more likely to develop ophthalmic abnormalities and therefore can be expected to visit an optometrist more frequently. Considering the social, communication, behavioural and sensory issues an autistic person may face, and how these could impact an eye examination, this research aimed to investigate the accessibility of optometric services for this population.

Two qualitative studies were conducted. In the first, focus groups with 18 autistic adults set out to explore their eye examination experiences. Participants suggested improvements to eyecare services by preparing patients for the visit, reconsidering practice operation (e.g. methods to book appointments and 'the patient journey') and clearer communication. They shared eye test-specific concerns and the importance of a good patient-practitioner relationship.

The second study collected more detailed information about which aspects of an eye examination are pleasant, what is difficult and what improvements can be made by means of one-to-one interviews during an eye examination. Preliminary findings suggest that our participants appreciated clear communication, but did not like tests which invoke sensory symptoms, such as those involving bright lights.

In summary, our findings suggest that eye examinations may not be very accessible for autistic people, but the experience can be enhanced considering each specific step involved in a patient's visit. From our results, we propose to produce guidelines and training for optometrists so they may provide more 'autism-friendly' services.

Life cycle analysis: end of life analysis of two contact lens replacement modalities

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Purpose: There is growing evidence of an increase in microplastic pollution of the aquatic environment, and wider environmental concerns regarding use and disposal of resources. This study examines the annualised waste produced by two representative contact lens (CL) systems and the end-of-life disposal of contact lenses and packaging.

Methods: Waste audits for a representative daily disposable system (somofilcon A) versus a reusable monthly replacement system (somofilcon A with multi-purpose solution) were conducted to quantify and identify materials. Once weighed and categorised, annualised figures were calculated using a model assuming compliant, full-time use. Disposal options were explored using information about household and specialist recycling streams to develop recommendations for responsible disposal of CL waste.

Results: Full-time daily disposable (DD) CL wear generates 1.06kg of waste annually compared to 0.83kg generated by reusable-monthly replacement daily wear CLs. For full-time use of reusable CLs, where packaging from lens and care solutions are combined, plastics accounted for 67% of waste by mass. With full-time use of DD CLs, 64% of waste by mass was plastic blister trays.

Conclusion: Full-time DD wear generates 27% more waste annually than full-time reusable lens wear. Reusable CL wearers can recycle 78% of waste at home. DD lens wearers have access to recycling options that allow them to recycle 100% of CL related waste. Full-time CL lens wear represents just 0.20-0.26% of the 412kg of household waste generated per person, per year in the United Kingdom. Worn CLs should never be disposed of down the sink or lavatory. CL wearers should be aware of responsible end-of-life recycling and disposal options for all CL waste.

Evaluating the importance of dynamic information on the recognition of identity from face composites

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Background
A small, but robust, recognition advantage has been found for dynamic vs. static familiar faces. There may be a generalised benefit for viewing a face moving naturally and / or each known face may have an associated 'characteristic motion signature'. In a criminal investigation, facial composites are images constructed by witnesses and victims of people seen to commit crime. Animation techniques have been found to improve composite recognition by people familiar with the target identities.

Methods and Results
In Study 1, composites of famous faces were animated in different ways. The greatest recognition advantage was found for faces animated using their own characteristic movement parameters. There was also an advantage for any movement compared with static presentation. In Study 2, we found the largest recognition advantage when famous faces were shown animated using their own characteristic motion parameters and by non-specific general motion - compared with own motion, general motion or static presentation alone.

Significance
Motion may aid recognition in different 'additive' ways. Results are discussed within a cognitive and visual framework and a forensic / applied setting.

Perception of Emotion from Dynamic and Static Faces: Validating a Novel Methodology

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University of Manchester.

Background
Facial emotion recognition (FER) is an essential element of interpersonal communication. Previous studies suggest that motion can aid emotion recognition, but most FER tests only include static stimuli. This study aims to validate a novel FER test using both dynamic and static stimuli.

Methods
20 control participants were recruited. Moving and static emotional face stimuli were presented for gradually increasing durations, ranging from 120ms to 480ms. Participants indicated the emotion after each stimulus presentation. Correct response duration (CRD) was measured for each stimulus (duration that was correctly identified). Mean dwell time was measured from eye-tracking data using manually delineated areas of interest (AoIs).

Results
Significant differences in accuracy and CRD based on emotion (p's < 0.001) were found, with joy recognised most accurately and with the lowest mean CRD. Mean accuracy was lower with dynamic stimuli. Dwell time varied significantly in each AoI based on emotion ($p < 0.001$).

Significance
Differences in emotion recognition accuracy fits with results from other FER tests, supporting the validity of this novel test. Differences in dwell time could suggest differences in strategy for different emotions. Follow up work is assessing the suitability of this new emotion recognition task in different participant groups.

Abstract

Exploring the recognition of emotion from dynamic and static faces by people with Parkinson's

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Background Previous research shows that people can better recognize emotion from dynamic compared to static faces (Trautmann et al., 2009). Preliminary work has suggested that this may also be the case for people with Parkinson's disease (PD) (see Bek et al., 2020), despite reported general difficulties in emotion recognition. In the planned study, we will comprehensively investigate the recognition of a broad range of emotions from dynamic versus static faces by people with mild-to-moderate Parkinson's.

Methods We will compare emotion recognition performance from 42 people with PD and 42 healthy controls. Nine emotions will be presented as dynamic and static.

Results We predict that (i) healthy controls will exhibit superior recognition of emotion from dynamic than static faces (ii)People with PD may (or may not) show this 'moving advantage' and will have overall lower accuracy in comparison to controls.

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Exploring the recognition of emotion from dynamic and static faces by people with Parkinson's

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Introduction

- People with Parkinson's (PwP) have an impairment in emotional facial recognition (EFR) (Jacobs et al., 1995); and production (hypomimia) (Simons et al., 2003).
- The loss of facial movement in PwP may contribute to difficulties in EFR (Tickle-Degnen & Lyons, 2004).
- Previous research has showed that people can better recognize emotion from dynamic compared to static faces (Trautmann et al., 2009).
- Some claim PwP have better EFR from dynamic expressions (Kan et al., 2002), while others believe static to be superior (Péron et al., 2011).
- Bek et al. (2020) compared dynamic and static recognition and found increased EFR from dynamic compared to static expressions for controls only, not PwP.
- Researchers claim EFR impairment in PwP is specific to certain emotions (Assogna et al., 2010; Clark et al., 2010), while others believe it is not (Alonso et al., 2013; Baggio et al., 2012).

❖ **Aim: To investigate EFR from dynamic and static expressions by PwP compared to healthy controls**

❖ To investigate how EFR may be influenced by type of emotion, mood (depression, anxiety, and apathy; see Argaurd et al., 2018) and motor symptoms Parkinson's

Experimental Design

Participants

We conducted an a-priori power analysis using G*Power3 (Faul et al., 2007) based on the findings of Bek et al. (2020)

- 42 participants with mild to moderate Parkinson's disease.
- 42 age matched healthy control participants.
- All participants will have normal or corrected-to-normal vision.
- Screened for cognitive impairment using Addenbrooke's Cognitive Examination-Revised (ACE-R; Mathuranath et al., 2000).

Materials and Methods

- Geriatric Depression Scale (GDS) (Sheikh & Yesavage, 1986).
- Geriatric Anxiety Scale (GAS; Gould et al., 2014).
- Apathy Scale (AS; Starkstein, et al., 1992).
- Unified Parkinson's disease rating scale (MDS-UPDRS; Goetz, 2010).

Experimental Design

Procedure

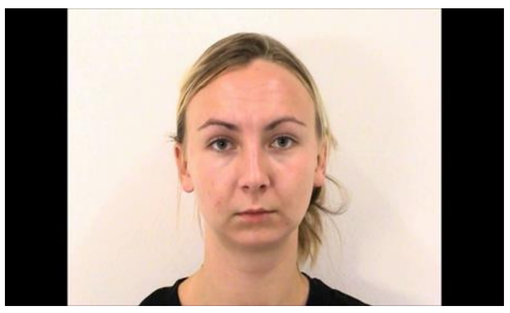
1. A video call via Zoom will take place, and participants will be asked for their demographic information.
2. ACE-R and UPDRS will be administered.
3. Participants will complete the EFR task and questionnaires (GDS, GAS, AS).

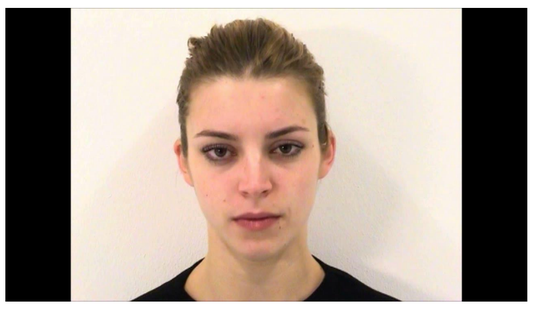
EFR Task

All participants will be asked to observe the displayed facial stimuli, and choose the correct emotion (from the list provided).

Stimuli

- 6 identities (3 males, 3 females) will be used from the Amsterdam Dynamic Facial Expression Set (ADFES; https://aice.uva.nl/research-tools/adfes-stimulus-set/adfes-stimulus-set.html).
- 9 emotions (anger, contempt, disgust, embarrassment, fear, joy, neutral, sad, surprise).
- 2 emotion intensities (low, high).
- 216 total trials (108 static and 108 dynamic).
- Dynamic and static images (in colour) will show apex of expression for one second, then a grey slide will appear.





Statistical Analysis Plan

- Two-way mixed ANOVA will be administered [group (Parkinson's vs controls) and stimuli (dynamic vs static)] to test for the effects of dynamic versus static across the two groups.
- A linear mixed model will be used to investigate other factors that could affect EFR accuracy for dynamic and static expressions. The measures are anxiety, depression, apathy, severity of Parkinson's motor symptoms, and dominant motor symptoms (left or right), as well as emotion type.

Predictions

- Controls will have better EFR for dynamic images in comparison to static images (as found in Bek et al. 2020). PwP may have reduced EFR overall and a reduced benefit of dynamic faces.
- High anxiety, depression and apathy will reduce EFR accuracy for both dynamic and static expressions of negative emotions.
- Increased motor symptoms of Parkinson's will be associated with lower accuracy in EFR for dynamic when compared with static expression. Symptom asymmetry (left, right) may interact with emotion type.

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Dynamic characterisation of Meibomian gland structure

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Meibomian glands are large sebaceous glands present in the upper and lower eyelid which produce the oily component of the tear film which is responsible for the retardation of evaporation, ensuring good ocular comfort and high-quality vision. The current method of Meibomian gland imaging (meibography) occurs at a single point in time, with the assumption that gland structure changes very slowly. Little is known about the relationship between gland structure and its function, as it is still unknown whether meibography captures gland structure or the presence of functional acini. This presentation reports on ongoing work to enhance our understanding of Meibomian gland physiology via the development of improved imaging systems and clinical studies targeted to measure changes in gland appearance.

Can the use of 'blue-blocking' spectacle lenses help to reduce eye strain?

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BACKGROUND: The use of light-emitting-diode (LED) backlit devices has increased people's exposure to blue light and is thought to cause digital eyestrain (DES). Blue-light blocking (BB) spectacle lenses are proposed to help reduce DES without high quality evidence. This study investigated the effect of BB spectacle lenses on blink rate and the symptoms of DES after digital-screen use.

METHODS: Thirty-eight visually normal subjects aged 18-35 years, requiring no refractive correction or wear contact lenses read silently for two 20-minute periods off a computer monitor screen whilst wearing, in random order, clear (placebo) or BB lenses. The subject's total blinks were counted and reading speed measured. Questionnaires were completed at baseline and after each 20-minute reading task to quantify DES symptoms.

RESULTS: Two subjects' data were lost. No significant differences were found in the subjects blink rate, questionnaire score or reading speed between the lenses. The change from baseline questionnaire score, to post reading task score, was significant with both lenses ($P < 0.001$). There was a significant increase in blink rate in the clear lenses from the first five minutes to final five minutes ($P = .010$). Incomplete blink rate could not be recorded.

SIGNIFICANCE: BB lenses do not improve symptoms experienced from DES. They may help maintain a steady blink-rate. Further research is still required to support the claims regarding these lenses.

Using Colour to Tell the Time

Josh Mouland (Presenting Author), Alex Watson, Franck Martial, Rob Lucas, Tim Brown

Light can be important for a number of behavioural functions outside of sight. Of particular interest is how light can regulate the internal body clock such that rhythmic biological processes (sleep/wakefulness, hormonal control & core body temperature) are aligned correctly with the external light dark cycle. Whilst the impact of variations in light intensity (irradiance) on the clock has been extensively investigated, far less is known about how daily variations in spectral composition (that occur during twilight) may impact the clock. As melanopsin, which seems to primarily encode irradiance to the internal body clock, is most sensitive to short wavelength light, a common misapprehension is that blue light is most potent in regulating the clock. However colour is largely independent of the degree of melanopsin activation. Here we used polychromatic light stimuli that were matched for melanopic irradiance but different in the ratio of mouse cone activation (and hence colour) to assess clock control in a multitude of different behavioural paradigms. Here we found that colour was able to modulate circadian responses to light and, contrary to popular belief, that 'bluer colours' (more in keeping with twilight) were less potent when compared to 'yellower colours'. Such findings are important as they show that cones also play a role in regulating the clock and that manipulating the spectra will differentially effect cones and melanopsin.

Antiphase regulation of rod and cone vision by the circadian clock

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Background
The functional demands of vision change dramatically across the day/night cycle. Central to meeting those changes is the shift from rod- to cone-based vision. While adaptation is known to be an important driver of that shift, a rich set of retinal processes are under control of the circadian clock. Here, we asked whether an output of such rhythms is to regulate the relative contribution of rods/cones to vision according to time-of-day.

Methods
We measured retinal responses in the mouse retina *in vivo* using the electroretinogram (ERG) throughout the circadian day. Using the method of receptor silent substitution, we isolated the response of either rods or cones, across a 5 log-unit range of background light intensities (maximum 65% Michelson contrast).

Results
Rod- and cone-evoked ERGs both demonstrated circadian rhythms in b-wave amplitude. Rod-driven responses peaked during the subjective night in light-adapted (but not dark-adapted) conditions. In contrast, cone-driven ERGs peaked during the subjective day, however this rhythm was only evident in bright (photopic) conditions.

Significance
These data highlight a fundamental way in which the circadian clock prepares the visual system for predictable changes in the visual environment, specifically, by driving a daily rhythm in the rod/cone contribution to vision.

A FAST DARK ADAPTOMETER

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Background

Dark Adaptation (DA) is the measurement of the recovery of sensitivity in the dark following exposure to a photobleach. Typically the technique is cumbersome and challenging for observers. DA is grossly abnormal in early Age Related Macular Degeneration (AMD) whereas photopic vision such as visual acuity is invariably normal.

Methods

An arc-shaped stimulus (565nm) superimposed on a red background (650nm) was created in a light-tight goggle-like viewing chamber. The test starts with the introduction of the bleach which induces profound loss of sensitivity. The observer sets a series of thresholds to the green stimulus (6° eccentricity) responding with a button press. Non-linear regression is used to fit the DA curve using 5 parameters.

Results

The DA curve (time vs sensitivity) is composed of cone- and rod-mediated phases separated by a distinct discontinuity called the alpha point. The device presents a real-time graphical readout of the DA curve and its parameters and errors. The data are updated between threshold settings. The test is terminated (~8-10 minutes) when the parameters of the DA curve reach satisfactory levels of repeatability.

Significance

The technique is ideal for clinics because it is faster and less demanding on observers than previous methods.

Genotype to Phenotype: Genetically driven increases in circulating Factor H-Related Proteins promote development of Age-Related Macular Degeneration

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Introduction

Age-related Macular Degeneration (AMD) risk is linked to genetic variants in a region of Chr1 that contains 6 related genes, producing 7 proteins; Complement Factor H (FH), a splice variant Factor H-Like 1 (FHL-1), and five Factor H-Related proteins (FHR-1 to -5). We developed a novel assay to quantify all seven gene products, to study the link between AMD risk genotype, protein expression and its relationship with AMD.

Methods

Circulating FH, FHL-1 and FHR-1 to -5 were measured in 604 individuals (352 AMD cases vs 252 controls) using Selected Reaction Monitoring (SRM-MS). Genome-wide association and Mendelian-randomisation analyses were performed to determine associations between genetics, protein levels and disease.

Results

FHR-1 and FHR-2 are significantly increased in AMD ($p=2.4x10^{-10}$ and $p=6.0x10^{-10}$), with modest associations of FHR-3 to -5, and FHL-1. GWAS revealed that AMD risk SNPs drive increases in circulating FHR proteins. Mendelian Randomisation analysis suggesting that the elevation of the FHRs is causative of AMD.

Conclusions

FHL-1 and FHR-1 to -5 are increased in AMD as a result of genetic risk variants. This provides the first evidence of the phenotypic effects of these SNPs. This study highlights FHRs as new targets for AMD treatment.