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INPLASY

Congenital colour vision deficiency in healthcare professionals: a scoping review protocol of the impact on clinical practice and patient safety

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ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - Preliminary searches.

Conflicts of interest - EL is colour vision deficient, known to have protanopia, and is a fully licensed medical practitioner in the UK but has no other competing interests.

INPLASY registration number: INPLASY2024110099

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 22 November 2024 and was last updated on 22 November 2024.

INTRODUCTION

Review question / Objective Population. The population for this scoping review is healthcare professionals in clinical practice or in training. The study will include other professionals who may be involved in healthcare (such as laboratory technicians) but are not involved in direct patient-facing activities. A list of relevant healthcare professions has been produced from the UK Government's National Careers Service website. This has the advantage of avoiding a strict definition and encompassing a wide range of roles in the sector.

Concept. The concept is congenital colour vision deficiency (colour blindness). It will be limited to colour vision deficiency and will exclude the impact of visual impairment alone and acquired colour vision deficiency.

Context. The context is how congenital colour vision deficiency can impact clinical practice and we will explore the potential effect on patient safety.

The search strategy aims to be comprehensive in including published studies. The study will include all available global studies and is not limited to geographic location or gender. The initial search strategy will not limit papers by language. An initial limited search of MEDLINE will be undertaken to identify articles on the topic and test the search strategy. The keywords contained in the titles and abstracts of relevant articles, and the index terms used to describe the articles will then be used to develop a full search strategy for databases that will include: PubMed, MEDLINE, Web of Science, SCOPUS, LENS.org and TRIP (filtered for low income countries). We will search the Overton Index for grey literature. The search strategy, including all identified keywords and index terms,

will be adapted for each included database and/or information source. The reference list of all included sources of evidence will be screened for additional studies.
Studies published since 1794 will be included. (This is the date of John Dalton's initial report deficiency and is the first published study on colour vision deficiency.)

Background Colour vision deficiency
Some individuals may find themselves unable to distinguish colours across the visible light spectrum resulting in the inability to fully distinguish between colours. Anomalous trichromacy, based on the normal trichromatic theory where vision is perceived colours (red, green and blue), is where there is trichromatic vision but there is deficiency in the ability to perceive one of the three light wavelengths. People affected are regarded as being colour vision deficient (CVD) although the term 'colour blind' is in common usage. The most common deficiency is in the ability to distinguish red and green, of which there are two sub-types: deuteranomaly and protanomaly. The red-green colour vision deficiencies of deuteranomaly, protanomaly, deuteranopia and protanopia are all X-linked recessive traits and are reported to affect between 2-8% of males and 0.5% of females.

Rationale One area that is under-researched yet could have important implications is the impact of CVD on the healthcare profession. The nature of the field sees colouration of bodily fluids, interpretation of imagery and other samples by colouration, as well as labelling of cables, tubes and stickers with colour to enable professionals to rapidly distinguish between identically shaped objects that are used for different purposes. Blood collection vials are a typical example of where CVD has the potential for impact on patient care. Similarly, detection of some patient symptoms may also be impacted/missed where there is discolouration of the skin in cyanosis, jaundice, pallor or erythematous rashes. There is some evidence that blood test strips and urine dipsticks, presence of blood or bile in bodily fluids, and the recognition of some clinical signs may present challenges for healthcare professionals with CVD.

METHODS

Strategy of data synthesis The search strategy aims to be comprehensive in including published studies. The study will include all available global studies and is not limited to geographic location or gender. The initial search strategy will not limit papers by language. An initial limited search of MEDLINE will be undertaken to identify articles on the topic and test the search strategy. (See Appendix 2) The keywords contained in the titles and abstracts of relevant articles, and the index terms used to describe the articles will then be used to develop a full search strategy for databases that will include: PubMed, MEDLINE, Web of Science, SCOPUS, LENS.org and TRIP (filtered for low income countries). We will search the Overton Index for grey literature. The search strategy, including all identified keywords and index terms, will be adapted for each included database and/or information source. The reference list of all included sources of evidence will be screened for additional studies.

Terms used to search for colour vision deficiency: TI colo#r vision deficiency OR AB colo#r vision deficiency OR TI colo#r blindness OR AB colo#r blindness OR TI colo#r blind OR AB colo#r blind OR TI colo#r vision deficiency OR AB colo#r vision deficiency

Terms used to search for healthcare professionals and allied professions: (doctors or physicians or healthcare professionals) OR (dentists or dental practitioners or dental professional) OR Acupuncturist OR Advocacy worker OR Ambulance care assistant OR Anaesthetist OR Anatomical pathology technician OR Art therapist OR Audiologist OR Biomedical scientist OR Care worker OR Children's nurse OR Chiropractor OR Clinical engineer OR Clinical psychologist OR Clinical scientist OR Cognitive behavioural therapist OR Community matron OR Counsellor OR Critical care technologist OR Dance movement psychotherapist OR Dental hygienist OR Dental nurse OR Dental technician OR Dental therapist OR Dentist OR Dietitian OR Dispensing optician OR District nurse OR Dramatherapist OR Emergency care assistant OR Emergency medical dispatcher OR Geneticist OR General Practitioner OR Health play specialist OR Health promotion specialist OR Health service manager OR Health trainer OR Health visitor OR Healthcare assistant OR Healthcare science assistant OR Homeopath OR Hospital doctor OR Hospital porter OR Hypnotherapist OR Learning disability nurse OR Maternity support worker OR Medical herbalist OR Medical illustrator OR Medical physicist OR Mental health nurse OR Microbiologist OR Midwife OR Music therapist OR Naturopath OR Nurse OR Nursing associate OR Nutritional therapist OR Nutritionist OR Occupational health nurse OR Occupational therapist OR Occupational therapy support worker OR Operating department practitioner OR Optometrist OR Orthoptist OR Osteopath OR Paediatrician OR Palliative care

assistant OR Paramedic OR Pathologist OR Patient advice and liaison service officer OR Patient transport service controller OR Pharmacist OR Pharmacologist OR Pharmacy assistant OR Pharmacy technician OR Phlebotomist OR Physician associate OR Physicist OR Physiotherapist OR Physiotherapy assistant OR Pilates teacher OR Plastic surgeon OR Podiatrist OR Podiatry assistant OR Practice nurse OR Prosthetist and orthotist OR Psychiatrist OR Psychological wellbeing practitioner OR Psychologist OR Psychotherapist OR Radiographer OR Radiography assistant OR Reiki healer OR School nurse OR Sonographer OR Speech and language therapist OR Speech and language therapy assistant OR Sports development officer OR Sports physiotherapist OR Sterile services technician OR Surgeon OR Yoga therapist.

Eligibility criteria Concept: The concept is congenital colour vision deficiency (colour blindness). It will be limited to colour vision deficiency and will exclude the impact of visual impairment alone and acquired colour vision deficiency. Context. The context is how congenital colour vision deficiency can impact clinical practice and we will explore the potential effect on patient safety.

Inclusion criteria: Global; earliest literature (first published study in 1794) to 30 November 2024; full text available in English; Healthcare professionals and allied professions as defined by list and included as keywords in the search strategy; People with congenital colour vision deficiency; Studies related to clinical practice or where patient safety could be a factor; Published and peer-reviewed literature; Grey literature including policy reports from established agencies

Exclusion criteria: Other professions not defined as healthcare or allied professionals; Literature related to acquired colour vision deficiency; Literature related to visual impairment alone without colour vision deficiency; Other studies not exploring either clinical practice or patient safety; Non-peer reviewed literature; Unpublished literature.

Source of evidence screening and selection Database sources will include: PubMed, MEDLINE, Web of Science, SCOPUS, LENS.org and TRIP (filtered for low income countries). We will search the Overton Index for grey literature. The search strategy, including all identified keywords and index terms, will be adapted for each included database and/or information source. The reference list of all included sources of evidence will be screened for additional studies.
Studies published since 1794 will be included.

The inclusion criteria are wide and the geographical scope is global but studies will be limited to those published in English or where there is an available translation. The inclusion and exclusion criteria are summarised in Table 1. Following the search, all identified citations will be collated and uploaded onto Zotero and the Rayyan platform and duplicates removed. Titles and abstracts will then be screened by two independent reviewers for assessment against the inclusion criteria for the review. Potentially relevant sources will be retrieved in full and their citation details imported.
The full text of selected citations will be assessed in detail against the inclusion criteria by two or more independent reviewers. Reasons for exclusion of sources of evidence at full text that do not meet the inclusion criteria will be recorded and reported in the scoping review.
Any disagreements that arise between the reviewers at each stage of the selection process will be resolved through discussion, or with an additional reviewer/s. The results of the search and the study inclusion process will be reported in full in the final scoping review and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for scoping review (PRISMA-ScR) flow diagram.[25]

Data management Data will be extracted from papers included in the scoping review by two independent reviewers using a data extraction tool developed by the reviewers. The data extracted will include specific details about the participants, concept, context, study methods and key findings relevant to the review question. The draft data extraction table will be modified and revised as necessary during the process of extracting data from each included evidence source and there will be an intermediate consistency check to ensure. As per JBI methodology we will take an iterative approach to data charting and data extraction as the review proceeds and the charting table will be updated as necessary. Modifications will be detailed in the scoping review. Any disagreements that arise between the reviewers will be resolved through discussion, or with an additional reviewer/s. If appropriate, authors of papers will be contacted to request missing or additional data, where required.

Reporting results / Analysis of the evidence The aim of the scoping review is to find all available evidence and understand the extent and range of

the research in this area. It should then also allow research gaps to be identified. We will assess the quality of the reviewed studies using JBI checklists. (https://jbi.global/critical-appraisal-tools) but reporting of the findings will be narrative.

Presentation of the results Results will be presented in tabular form and a descriptive summary of the findings will link the findings and results to the aims of the scoping review.

Language restriction There will be no language limits on the initial search but final selection will be limited to articles published in English or with an available translation.

Country(ies) involved The scoping review is based in the UK and with involvement of an Namibian co-author.

Other relevant information Ethics: This study will not include humans or animals as participants. Data will be sourced from published literature and does not require ethic approval.

Keywords Color blindness; inherited color blindness; color vision defect; physician impairment; diagnosis; clinical skills.

Dissemination plans This scoping review will offer insights into the current evidence around congenital colour vision deficiency and clinical practice. This has potentially important implications around patient safety and will be of interest to various stakeholders. The full results of the scoping review will be submitted for open access publication in a relevant journal to ensure that the findings are freely available to the public, educationalists, clinicians, researchers and policymakers.

Contributions of each author

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