Physical activity among older adults with visual impairment: A scoping review

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Abstract

In this paper, we present a scoping review of literature on aging, visual impairment, and physical activity. Our objectives are to: (a) explore the available literature on aging, physical activity, and sight loss; (b) describe how participation in physical activity by older adults with visual impairment is understood by researchers; and, (c) identify benefits, barriers, and facilitators of physical activity participation as reported by older adults with age-related sight loss. Over 2000 sources were reviewed, with 30 studies meeting eligibility criteria. Findings were organized into four thematic categories, namely: (a) participation rates; (b) health inequalities; (c) barriers to physical activity participation; and, (d) benefits of physical activity participation. Through this scoping review process, extant knowledge was synthesized and gaps in the literature were critically assessed. To address these gaps, several avenues for future research are outlined and described, alongside a consideration of the implications of the scoping review findings for both policy and practice.

Keywords: visual impairment, sight loss, older adults, physical activity, scoping review

Physical activity among older adults with visual impairment: A scoping review

The health benefits of participating in regular physical activity have been well documented (Hallal et al., 2012). Physically active older adults are seen to have lower risk of disease, including dementia, and higher levels of physical and cognitive function, psychological well-being and independence than inactive older adults (Craig, Mindell, & Hirani, 2008; United Kingdom's Department of Health (DoH, 2011). Yet many people, especially as they grow older, fail to undertake even the minimum amounts of physical activity that are recommended for health (30 minutes of at least moderate physical activity on five or more days per week) (Davis, Fox, Hillsdon, Coulson, & Thompson, 2011). This scenario is exacerbated for those experiencing some form of disability, such as visual impairment (Department for Work and Pensions, 2013).

Almost two million people in the United Kingdom (UK) are living with visual impairment that has a significant impact on their daily lives (Fight for Sight, 2013). This phenomenon is increasingly linked to age, with 1.7 million people over the age of 65 having significant vision loss (McLaughlan, 2006). The health and well-being of this growing and aging population requires attention, yet despite these figures, little research exists concerning physical activity among older people who are visually impaired. While statistics on physical activity participation by older adults (60+) with sight loss are unavailable, an alarming picture emerges if we are to consider the combined impact of: (a) the prevalence of age related sight loss, (b) the increasing number of older adults within our society, and, (c) the particularly low levels of physical activity within older cohorts and among people with a disability.

The DoH physical activity recommendations are as relevant to older adults with sight loss as their sighted peers. To date, however, both research and policy have had little to say about the involvement of older adults who are experiencing late onset sight loss, nor how

their participation can be facilitated. Policy makers and organizations cannot assume that what is known about one population (e.g., older people with sight; young physically active; young people with visual impairment) can simply be copied into recommendations for promoting physical activity for another population (e.g., older adults with age-related sight loss). Developing knowledge regarding this specific group is necessary to make meaningful changes in activity levels and subsequent health and well-being indicators. The first step in the development of knowledge in this area is to respond to the question: *what **is** known about physical activity in relation to older adults with visual impairment*?

Addressing such a question is not straightforward. The reason is largely due to issues surrounding definitional terms and inconsistencies regarding who counts as physically active, old and visually impaired. For example, while the World Health Organization (2015) defines physical activity as any bodily movement produced by skeletal muscles that requires energy expenditure, for significant health benefits to be incurred (our underlying driver for focusing attention on this somewhat forgotten group), physical activity must be undertaken at a moderate intensity and for a certain period of time. To make claims about whether a group is physically active or not, requires objective measurement. There are multiple ways of measuring physical activity. These include the use of accelerometers, pedometers, and self-reported questionnaire (Davis et al., 2011; Tudor-Locke & Myers, 2001). For the purposes of this review, the term physical activity is interpreted broadly to include both objectively and subjectively measured activities.

Similar definitional issues exist in relation to the term “older adults”. Indeed ‘old age’ can be defined socially, biologically and chronologically (Vincent, 2003). Moreover, the ‘number’ ascribed to it differs across disciplines. For example, while the literature in adult development and exercise and sport sciences typically identifies with the traditional retirement age of 65 years, the general principle of public health is that upstream intervention

earlier in the life course is preferable to attempting to cure in later life. Accordingly, discussions around improving health and well-being in 'older age' often focus on the fifth decade (Rachel, Doyle, Grundy, & McKee, 2009). This latter, broader conceptualization of older age is employed within this study.

Finally, the terms 'sight loss' or 'visual impairment' can encompass a broad spectrum of eye conditions and sight experiences that might range for occasional spectacle / contact lens use to being registered as blind (severely visually impaired). Measuring visual impairment can include self-report (e.g. "I have significant difficulty undertaking daily tasks"), objective measures such as a person's visual acuity (VA – central vision that is used to see detail) and visual field (VF – how much one can see around the edge of vision, while looking straight ahead), the results of which certify someone as being either sight impaired (partially sighted) or severely sight impaired (blind) (Royal National Institute for the Blind, 2015). In addition, the presence of eye conditions known to impact negatively upon a persons' sight is also often used to categorize individuals as being visually impaired or otherwise. Such eye diseases include: age-related macular degeneration (AMD), diabetic retinopathy, diabetic maculopathy, cataracts and glaucoma. For this review, visual impairment is defined broadly to include any age-related loss of vision that cannot be entirely corrected with the use of lenses (i.e., glasses or contact lenses).

Inconsistencies with the definitions of physical activity, older age and visual impairment have negative implications for the claims that can be made from the extant research. Standardization of terminology is therefore an important area requiring more focused attention in future. That noted, the purpose of this scoping review is to offer a picture of a landscape that is largely unknown. Accordingly, our preoccupation at this stage was not to become embroiled in definitional dilemmas. These might have detracted us from being able to offer an original (and early) contribution to knowledge through the amalgamation of

current thinking, and a subsequent informed response to the question, *what **is** known about physical activity in relation to older adults with visual impairment*? The following section describes the scoping review approach in more detail.

Scoping Review

The aim of a scoping review is to identify the nature and extent of the research evidence on a given topic (Grant & Booth, 2009). It involves systematically reviewing the literature with the purpose of mapping the key concepts underpinning a research area (e.g., physical activity, aging, and sight loss) along with the main sources and types of evidence available (Mays, Roberts, & Popay, 2001). A scoping review is desirable compared to other types of reviews for two reasons. First, most kinds of methods for reviewing literature funnel down on a narrow research question. These methods only examine research data that have been collected using certain techniques (e.g., quantitative questionnaires *or* qualitative interviews), and do not tend to span disciplines. Second, many reviews do not go beyond the research findings nor seek to identify gaps in the existing literature or problems with the research. Scoping reviews, however, include and disseminate findings from a range of different methods (Mays et al., 2005). They critically address broader topics where many different study designs might be applicable. Other reasons for using a scoping study are described by Arksey and O'Malley (2005). These authors note how:

> A key strength of the scoping study is that it can provide a rigorous and transparent method for mapping areas of research...This analysis in turn makes it possible to identify the gaps in the evidence base, as well as summarizing and disseminating the research findings. By presenting the results in an accessible and summarized format, policy makers, practitioners and consumers are better placed to make effective use of the findings. (Arksey & O'Malley, 2005, p. 30).

That noted, and of relevance to our point above regarding how we dealt with definitional dilemmas, scoping reviews are not intended to offer the final answer on a topic. Rather, their value connects to the ability to ascertain in general terms, what we know, what we do not know, and whether a full systematic review of evidence is required (Grant & Booth, 2009).

The aim of the scoping review reported here was to generate knowledge on physical activity among older people with visual impairment. Specifically, the objectives of the review were to:

- Explore the available literature on physical activity, aging, and visual impairment;
- Describe how participation in physical activity by older adults with visual impairment is understood by researchers;
- Identify benefits of, and barriers and facilitators to physical activity participation in relation to older adults with visual impairment;
- Identify implications of these findings for policy;
- Identify future research directions to inform the advancement of theory, policy and best practice.

Method

According to Arksey and O'Malley (2005), there are five stages that constitute a scoping review. The five stages, along with the manner in which they were applied to the topic in question, are presented below.

Stage 1: Identify the Research Question

The research question in this instance was: 'What is known from the existing literature about physical activity in relation to older people with visual impairment?'

Stage 2: Identify Relevant Studies

To identify studies on physical activity, aging, and visual impairment, different sources were searched, including electronic databases, reference lists, key journals in university libraries, conference proceedings, relevant organizations and existing networks. Key words related to the project (i.e., physical activity (/leisure/sport) AND sight loss (/partial sight/visual impairment) AND ageing (/aging)), were entered into the following databases: AMED (EBSCO), Science Direct, Wiley Online Library, SocINDEX, CINAHL, MEDLINE (PUBMED), and GOOGLE SCHOLAR. Grey literature – defined as non-peer reviewed but published studies – was also reviewed, from national and local-level sight loss organizations as well as sporting and governmental authorities.

Stage 3: Select Studies That Meet the Inclusion Criteria

The following inclusion criteria were applied to identified studies:

- The research (or commentary) contributes to an understanding of physical activity and older adults with visual impairment.
- The research was published in English, either in a peer reviewed journal or as grey literature produced by an organization with a vested interest in this topic including sight loss charities (e.g. Royal National Institute for the Blind), disability organizations (e.g. English Federation of Disability Sport), sport and physical activity advocates (e.g. Women in Sport).
- The research was published in 1999 or thereafter.
- Empirical papers primarily focused on adults over the age of 55 years. Where younger participants were also included in the sample, publications would only be included if there was a specific focus on the older participant (in terms of findings / discussion / recommendations) within the text.

Study selection criteria were finalized *post hoc*, based on increasing familiarity with the literature, that we could then apply to all of the citations to determine their relevance. For

example, due to a dearth of literature covering each of the three relevant topic areas (i.e., physical activity, aging *and* visual impairment), what constituted physical activity was widened to include mobility and 'activity limitation' measures, as well as broad measures of leisure-time activities. Two reviewers then applied the inclusion criteria to all of the citations, ensuring a uniform approach to all studies included in the review.

The search yielded over 2200 papers, excluding duplicates. Titles and abstracts were screened against the inclusion criteria, and 109 publications were selected for inclusion based on title and abstract. From these, 88 were excluded after full text review, resulting in 21 included articles. Papers were excluded when (a) the sample consisted solely of children or young adults (<25 years of age), or ages were not reported, (b) the type of visual impairment was either congenital or stable from childhood (i.e., not age-related or deteriorating over time), or the type of visual impairment was not reported, and (c) the sample combined visual impairment with other sensory and/or physical impairments and did not distinguish between them in terms of findings, discussion or recommendations. Reference chaining yielded a further seven articles, and two documents were located in a search for relevant grey literature resulting in a total of 30 studies (see Figure 1).

Stage 4: Chart the Data

Using a technique called 'charting', we synthesized and interpreted the data by sifting, charting and sorting material according to key issues and themes. Each author independently charted the included citations, and categories were agreed upon and confirmed by consensus.

Stage 5: Collate, Summarize and Report Results

Here data were described and interpreted. Findings are reported in the results section. Because the literature exploring physical activity and sight loss in older age is diffuse and diverse, the included publications were characterized by heterogeneity of design, sample characteristics, outcome assessment and outcomes examined. Consequently the data could

not be pooled for comparison or analytical purposes. However, critical analysis of collected data is neither the aim nor purpose of a scoping review. Such a review does not seek to synthesize evidence or to aggregate findings from different studies, and makes no attempt to assess the quality of evidence (Arksey & O'Malley, 2005). Instead, we present an overview of all the material reviewed, identifying the breadth of available literature and key issues and themes therein (Green & Thorogood, 2004). Through this process, we were able to ascertain the dominant areas of research and interest on the topic, identify contradictory evidence and any significant gaps in the knowledge base, and consider possible implications and future research directions for policy-makers.

Results

A thematic assessment of the literature (Ritchie & Spencer, 1994) identified four broad subject areas into which included literature could be grouped. These were: a) participation rates; b) health inequalities; c) barriers to physical activity participation; and d) benefits of physical activity participation.

Participation Rates

Many of the included publications reported on population-based, epidemiological studies and employed analysis of existing survey data. As such, the samples were not made up solely of older adults with visual impairment, but measures of visual impairment and visual acuity were collected (self-report and clinical eye tests). The secondary survey data were then analyzed to evaluate the effect of visual impairment on (activity) participation rates. In general, evidence was presented that sensory impairments (and visual impairment in particular) are associated with reduced participation in activities (Clark, Bond & Sanchez, 1999). Definitions and outcome measures as they pertained to 'activity' varied widely, but across the board those with vision loss/visual impairment reported consistent disparities in leisure activities and social participation (Crews & Campbell, 2004; Heyl, Wahl, &

Mollenkopf, 2005). Visual impairment was reported to be a significant risk factor for activity limitations and participant restrictions, as people with vision problems were less likely to participate in an exercise program, walked less, and did less physical activity on the whole than their sighted peers (Crews & Campbell, 2001).

Other included publications drew their samples specifically from the older population with visual impairment, recruiting from low-vision rehabilitation centers, eye clinics, sight loss organizations, and senior's centers. Again, research designs varied and 'activity' was diversely defined. However, findings were similar: a) older adults with visual impairment participated less in heavy household activities, recreational activities, and sports activities when compared to the sighted population (Alma et al., 2011); b) compared with people without visual impairment of the same age and sex, those with visual impairment had a lower level of participation in all domains (including fitness and leisure) (Desrosiers et al., 2009); and, c) the greatest areas of restriction of participation were associated with reading, outdoor mobility, participation in leisure activities, and shopping (Lamoureux, Hassell, & Keeffe, 2004). The degree of sight loss was important, in that greater levels of visual field loss were associated with substantial reductions in physical activity and walking (Ramulu et al., 2012), and decreased visual acuity was associated with restricted 'important life aspects' including work, reading, and sports/leisure (Coyne et al., 2004). Burmedi, Becker, Heyl, Wahl, and Himmelsbach (2002) found that the decline in leisure activities occurs mainly in those activities that require the greatest visual ability, and thus noted that age-related low vision seems to be highly detrimental to mobility and the pursuit of vision-dependent leisure activities.

As Burmedi et al. (2002) note, because leisure activities are more voluntary and optional in nature than activities of daily living (ADL), psychological (e.g., motivational) variables are more prevalent with respect to individual engagement and participation. In

addition, other variables such as age, health, and marital status can contribute to increased vulnerability with regard to leisure activities (Stevens-Ratchford & Krause, 2004). An influential characteristic identified through the scoping review was that of health inequalities.

Health Inequalities

Health inequalities among older adults with visual impairment were well-documented. Research designs were epidemiological in nature. For example, one article found that lowered vision is a risk factor for injurious accidents independent of mobility and physical activity (Kulmala, Tormakangas, Parssinen, Rantanen, & Heikkinen, 2008a). However, the primary approach within this thematic category consisted of longitudinal research on samples with existing, diagnosed eye conditions. Swanson, Bodner, Sawyer, and Allman (2012) found that older adults with lower levels of visual acuity have reduced levels of leisure-time physical activity, and an overall reduction in caloric expenditure even after controlling for health-related confounding variables (e.g., age, gender, race, education, location, BMI, Geriatric Depression Scale score, cognitive-status score, validated comorbidity index, and number of medications taken). These findings echo and overlap with literature on participation rates in general. From this view, participation rates are lower *because* of the visual impairment itself, and impairment is the cause of participation/activity restriction. Consequent inactivity then leads to and, indeed, compounds the various established health inequalities of those with visual impairment. For example, Seddon, Cote, Davis, and Rosner (2003) evaluated anthropomorphic, behavioral and medical factors associated with progression to advanced stages of age-related macular degeneration, finding that increased levels of physical activity tended to decrease the risk of disease progression.

On the other hand, several scholars included in this scoping review examined the presence and impact of co-morbidities on physical activity participation, positioning particular health inequalities as barriers and constraints for the older adult with visual

impairment. Having performed a secondary analysis of survey data, Crews, Jones, and Kim (2006) found that older adults with visual impairment frequently experience comorbid conditions, and these conditions are associated with difficulties in walking and climbing steps, shopping, and socializing, and resulted in significantly more self-reports of declining health during the previous 12 months. The most intensively investigated comorbid condition was that of depression. Jones, Rovner, Crews, and Danielson (2009) found that older adults with visual impairment who had depressive symptoms were more likely than adults with neither condition to smoke, be physically inactive, have poor health, have difficulty with self-care, and have lower social participation. Poorer visual acuity (VA) was associated with greater activity loss and more depressive symptoms (Rovner & Casten, 2002). For this reason, it is suggested that depression (as a health inequality) neither causes physical inactivity nor is caused by it – rather there is a strong correlation between the two.

However, as Kulmala et al. (2008b) emphasized, whatever the reason or cause for physical inactivity within the older visually impaired population, it requires attention because lowered vision is a significant predictor of mortality. They explained that increased risk of mortality is attenuated by lower walking speed, physical inactivity, cardiovascular diseases, injurious accidents, diabetes and depressed mood (Kulmala et al., 2008b). In summary, health inequalities can thus act as barriers to physical activity participation, but in many cases physical activity can also benefit the visually impaired older adult in helping to reduce some of these health inequalities.

Barriers to Physical Activity Participation

Beyond a consideration of health inequalities, the scoping review did not unearth many studies that focused in detail on barriers to physical activity participation among older adults with sight loss. Indeed, merely four included articles fell into this category and these were divergent in nature. The first, by Wahl, Heyl, and Schilling (2002) explored the

interrelations between vision impairment, outdoor activity, and life satisfaction in older adults. Their findings highlighted the importance of considering visual functioning alongside other psychosocial mediators, including motivational forces and personality aspects (such as extraversion and openness to experiences) (Wahl et al., 2002). The argument made was that engagement in outdoor activities does not relate to one's fundamental independence, and so it has more to do with the optional use of opportunity structures to improve one's life quality (Wahl et al., 2002). As such, lack of motivation for physical activity can be a barrier to participation among individuals with visual impairment.

Another important barrier to physical activity participation was identified by Rudman and Durdle (2008), who explored how older adults with low vision experience and manage community mobility – that is, the ability to travel to places outside the home by various means of transportation. This work discovered that participants continually gauged risks associated with mobility and engaged in risk avoidance and management strategies – often restricting community mobility because of perceived risks, and leading to reduced participation in a range of physical, social, and other activities. A core element of community mobility was living with a pervasive sense of fear of: (a) the risk of bodily harm, and (b) not being able to interact in the world in ways that supported personally valued qualities associated with one's sense of self and lifestyle (Rudman & Durdle, 2008).

Thirdly, Rimmer (2006) provided an overview of the major areas that required consideration to improve access to various physical activity venues for people with vision loss. This author aligned this commentary with the social model of disability, which posits that disability is the result of socio-structural barriers that serve to exclude and restrict people with impairments. Although not specific to the older adults per se, yet still a useful insight into designing physical activity programs for people with visual impairment, Rimmer (2006) discussed four areas where attention to inclusivity could reduce potential barriers to

participation: the physical built environment (i.e., pavement grade and quality, lighting, obstacles, signage, etc.), exercise equipment (i.e., voice activated, raised lettering or braille consoles on cardiovascular machines), group exercise classes (i.e., awareness and training of coaches, physical guidance), and commercial and print media (i.e., alternative formats). These recommendations are equally relevant to older adults with a visual impairment.

Lastly, the English Federation of Disability Sport (Rankin, 2012) produced a qualitative research report with the aim of better understanding the real and perceived barriers that may prevent people who are disabled and Deaf from taking part in sport. Their sample consisted of four impairment-specific focus groups, one of which was made up of individuals who were blind and partially sighted. Again, this research did not solely address the older visually impaired population. However, there were older individuals (up to age 63) taking part. A wide range of barriers to participation in physical activity was reported, including those regarding accessibility (of buildings and/or equipment), a lack of awareness and/or training by staff/program leaders, insufficient opportunity for participation (particularly for those past school age), poor dissemination of information, and risk of injury. This report, considered as a piece of relevant grey literature, also included participant-led recommendations for changes needed to address and remove the experienced barriers (Rankin, 2012). As one example, participants suggested the provision of disability awareness training to staff of all fitness facilities, as well as within sports degree curriculums at colleges and universities.

Benefits of Physical Activity Participation

The report produced by the English Federation of Disability Sport (Rankin, 2012) also identified several benefits of sport participation for individuals who are disabled and Deaf. Focus group members (who had a range of ages and disabilities, but included older adults with visual impairment) suggested that participating in sport offers: fun, a learning

opportunity, an opportunity for progression and improvement, confidence-building, improvement in physical fitness, and socializing opportunities. The social and confidence benefits of physical activity participation were also echoed within literature specific to older adults with visual impairment (Green & Miyahara, 2008). Again, this work highlighted the importance of considering personal and situational factors on levels of physical activity, including degree of visual impairment, personal history and experience with physical activity, living environments, and social interactions (Green & Miyahara, 2008).

Surakka and Kivela (2008) found that older adults with visual impairment who participated in a 6 week physical training program all experienced improvements with respect to physical condition, mental state, and balance. The scoping review found that the majority of research considering the benefits of physical activity for older adults with visual impairment covers similar areas (i.e., falls and balance, mobility and strength). Some of the research in this category was concerned with exploring these topic areas within a cohort, prospective setting. For example, de Boer et al. (2004) examined and established the role of physical performance, functional limitations, and physical activity as mediators in the association between visual impairment and falls and fractures. Another type of research within this theme was intervention based: evaluating exercise or physical activity programs delivered to older adults within a visually impaired population setting. Within this type of research, physical activity is proposed as a tool for fall prevention. Included articles considered home exercise programs (Campbell et al., 2005), strength, balance and walking training (Kovacs et al., 2012) and Tai Chi classes (Chen, Fu, Chan, & Tsang, 2012). All of these studies reported improved functional mobility, strength, proprioception and balance, and confidence as well as fewer incidences of falls.

Mapping gaps

This scoping review examined research findings of published and grey literature on the topic of aging, visual impairment, and physical activity. In addition to highlighting what *is* known about this issue, such a review can also illustrate important trends relative to existing knowledge gaps. For example, with respect to participation rates in the UK, there is no precise record of how many older adults with visual impairment are participating in physical activity. There is substantial evidence demonstrating that physical activity levels decrease with age. Meanwhile, prevalence rates indicate that visual impairment increases with age. However, to date, these figures have not been combined to produce an accurate representation of this specific issue. Understanding the scale of the situation is a crucial starting point for any future research in this area. A level of sophistication in this process is required to capture the complexity of visual impairment, the multiple forms it can take (i.e., in terms of level and nature of vision, and timing of vision loss) and the subsequent impact of these differences on activity levels.

Research into the health inequalities that are experienced by older adults with visual impairment have largely concentrated on why inequalities are experienced. As an example, for some older adults, visual impairment leads to inactivity, which results in health inequalities (e.g., depression). For other older adults with a visual impairment, it is the specific health inequality (e.g., depression) rather than the visual impairment itself that leads to inactivity (McDonall, 2009; 2011; Rovner & Casten, 2002). This focus on the various pathways to physical inactivity has permitted useful insight into a generally overlooked cohort. That said, what is missing is a focus on *how* health inequalities might impact upon one's subjective experiences of having the opportunity to participate in physical activity.

Despite the plethora of literature exploring older people's barriers to physical activity (i.e., Booth, Bauman, & Owen, 2002; Lim & Taylor, 2005; Schutzer & Graves, 2004), only

four research papers specific to older adults with visual impairment were identified in this scoping review. Clearly, there is a great need for further research in this area if we are to fully capture and subsequently act upon the additional challenges that this cohort might face relative to their involvement in physical activity. This avenue of inquiry would do well to consider barriers in terms of their co-existence, as opposed to examining each in isolation. For example, addressing the accessibility of the physical built environment within a fitness facility might need to be considered alongside the social *and* psycho-emotional barriers that older adults with visual impairment may also face (Thomas, 2007).

The social model understands disabled people as socially oppressed, and asserts that disability is not caused by impairment but by the social barriers (structural and attitudinal) that people with impairments (e.g., physical, sensory, and intellectual) come up against in every arena. However, the psycho-emotional dimensions of individual's lives with a disability are not deliberately attended to within the social model (Goodley, 2011; Smith & Sparkes, 2012; Thomas, 2007). For example, psycho-emotional disablism "…involves the intended or unintended 'hurtful' words and social actions of non-disabled people…in interpersonal engagements with people with impairments" (Thomas, 2007, p. 72). As such, we are left with an inadequate understanding of the complex ways in which people with a disability are restricted from engaging in physical activity. In light of this inadequate understanding of disability, and recent criticisms of the social model (see Goodley, 2011), one possible way forward is to consider the social *relational* model of disability as described by Thomas (2007). This has not been attended to in terms of adults with visual impairment. However, it holds much potential value.

The social relational model describes disability as "a form of social oppression involving the social imposition of restrictions of activity on people with impairments *and* the socially engendered undermining of their psycho-emotional well-being" (Thomas, 2007, p.

418 73, italics added). Conceptualized this way, this model uniquely extends the social model by
419 proposing that it is not just the physical environment that restricts people's physical activity.
420 The social relational model also deliberately proposes that restrictions of activity arise when a
421 person's psycho-emotional well-being is damaged. One way this damage can occur, and thus
422 activities restricted, is through interactions with other people. For example, a person's
423 psycho-emotional well-being might be damaged when a group of people at the gym aim
424 hurtful words at them or when the gym manager claims that because they are visually
425 impaired they pose a 'health and safety' liability. In such social interactions, the potential
426 damage and/or undermining of the older adult's psycho-emotional well-being might result in
427 their future avoidance of the gym altogether. Hence, damage to psycho-emotional well-being
428 can place limits on what one *can do* and *can become*.

429 Another gap that can be observed from this review revolves around the benefits of
430 being physically active for older adults with visual impairment. Much of this research can be
431 located within the falls prevention literature and predominantly aims to address the additional
432 challenges that aging with a visual impairment might entail (e.g., balance). While making a
433 useful contribution to knowledge, this emphasis comes at the expense of an appreciation for
434 other benefits that might be derived from participation (e.g., social interaction, enjoyment,
435 development of new skills). In addition, the extant literature seemingly overlooks the variety
436 of available opportunities with regards to type of activity that can be undertaken (facilities
437 permitting). To gain a more comprehensive understanding of how and why physical activity
438 can benefit older adults with visual impairment, there is a need to examine a variety of
439 activities beyond those typically examined (i.e., T'ai Chi and yoga).

440 A final gap that can be observed from this scoping review revolves around the
441 methods and methodologies that are used to understand physical activity among older adults
442 with visual impairment. Traditionally, quantitative methods have largely been relied upon.

Innovative qualitative methods are needed to further extend knowledge and facilitate change. This might involve exploring other sensorial dimensions of physical activity for older adults with a visual impairment by adopting an ethnographic approach or developing sensory awareness in qualitative interviews (Sparkes & Smith, 2012; Harris & Guillemin, 2012). Similarly, the use of Global Positioning Systems (GPS) and *geo-narrative* (see Bell, Phoenix, Lovell & Wheeler, 2015) data could offer important insight into the typical movements, activities and interactions in relation to specific environments.

Moreover, rather than simply producing research *about* older adults with visual impairment, researchers might harness the benefits of participatory action research (PAR) that promotes working *with* older adults with visual impairment throughout the entire research process (from identifying the research questions to disseminating the results and implementing change). As a collaborative methodology, which is founded on the assumption that academic researchers and community members can come together in some ways to create and change practices, PAR would offer the benefit of developing knowledge from the actual standpoints of older adults with visual impairment themselves about which methods are best for research (Kemmis & McTaggart, 2000). Significantly, and perhaps most importantly, PAR contributes to the discovery and development of the conditions and actions for social change that are both meaningful and sustainable for the population being studied (e.g., see Holt et al., 2013).

Concluding Comments

Given the growing proportion of older adults experiencing and living with sight loss, this article presented a scoping review to illustrate what is known (and not known) about physical activity participation within this population. Addressing multiple types of literature, we hope this comprehensive knowledge synthesis will guide research, government, and non-profit/charity agendas. Seeking a focused understanding of physical activity among older

adults with sight loss, a review of the 30 included sources identified four main themes that summarize what is known about aging, physical activity, and visual impairment. These themes are characterized by a focus on: (a) *participation rates*: measuring and recording the rate of physical activity participation within this population; (b) *health inequalities*: measuring, recording, and collating the health risks and experiences faced by older adults with sight loss (often linked to activity restrictions); (c) *barriers to physical activity participation*; and (d) *benefits of physical activity participation*. Using insights gleaned from the scoping review, we suggest that participation in physical activity has significant implications for older adults with sight loss. An example is the potential for physical activity to improve balance and decrease falls, and thus decrease injuries and accidents within this population.

The many differences in background, reporting, aim, content and implementation of research on physical activity, aging, and visual impairment made it challenging to undertake systematic comparisons. However, this scoping review represents a first step toward developing a set of heuristics for decision-makers and health professionals to begin addressing physical activity as an important health and leisure practice in the lives of older adults with sight loss. Many decision-makers are seeking academic support and advice in moving forward in this area. Ultimately, the intention of such research would be to produce best practice guidelines to maximize engagement with physical activity among older adults with sight loss. Clearly, further study is needed before there is sufficient evidence to make such recommendations as, ‘if you are 60+ and visually impaired, then X and Y are the appropriate physical activities for you’. It is necessary for future work in this area to be more consistent with terminology, measures and definitions of visual impairment, age categories/distinctions, and physical activity. Careful consideration of the context and the individual must also occur before any particular approach to encouraging participation is

adopted. The next immediate step is to identify specific research projects to address key gaps identified through this scoping review. In our view, this can only be done through collaboration between decision-makers faced with real world constraints in designing and delivering activity opportunities, older adults with a visual impairment themselves, and researchers with interests in this important topic area.

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669 **Table 1 – Publications included in the review.**
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No.	Authors	Number of participants	Age range of participants	Type(s) of visual impairment represented
1.	Clark et al. (1999)	1052	70 - 103	Determined by clinical assessment and self-report "conclusion: vision impairments are more likely to lead to reductions in activities than hearing impairments, particularly when the activities are physically demanding or optional" (p. 124)
2.	Rovner et al. (2009)	206	64+	AMD VA of 20/70 or worse (in better eye)
3.	Crews & Campbell (2004)	9447	70+	Participants self-reporting vision problems in Second Supplement on Aging II (SOA-II, National Center for Health Statistics)
4.	Heyl et al. (2005)	1519	55 - 98	VA ≤ 0.02 (functional blindness according to criteria of the German Ophthalmological Society)
5.	Crews & Campbell (2001)	8767	70+	Representative population, not all VI, survey asked 8 questions re vision.
6.	Alma et al. (2011)	173	55+	Newly registered visually impaired older persons at Royal Dutch Vision (a low vision rehabilitation provider).
7.	Desrosiers et al. (2009)	64	65+	VA worse that 20/70 or VI < 60 degree in better eye.
8.	Lamonreux et al. (2004)	319	Mean age 78.4 ± 12.9	VA <6/12 (better eye)
9.	Ramulu et al. (2012)	141	60-80	Diagnosed with glaucoma

10.	Burmedi et al. (2002)	Narrative review	Articles regarding “the elderly”	Various
11.	Coyne et al. (2004)	15	61 ± 12.3	Diagnosed with diabetic retinopathy
12.	Stevens-Ratchford et al. (2004)	2	75, 85	AMD
13.	Seddon et al. (2003)	261	60+	AMD
14.	Swanson et al. (2012)	911	65+	VA worse that 20/50 and 20/80
15.	Crews et al. (2006)	49278	65+	Self-defined as VI within large population based sample.
16.	Jones et al. (2009)	49278	65+	Variety of VI, severity not stated.
17.	Rovner & Casten (2002)	51	64+	AMD with VA <20/70
18.	Kulmala et al. (2008a)	416	75 - 80	Comparison between ‘visually impaired’ (VA = < 0.3), ‘lowered vision’ (VA = > 0.3 but < 0.5) and ‘normal’ (VA > 0.5).
19.	Kulmala et al. (2008b)	416	75 - 80	Comparison between ‘visually impaired’ (VA = < 0.3), ‘lowered vision’ (VA = > 0.3 but < 0.5) and ‘normal’ (VA > 0.5).
20.	Wahl et al. (2002)	404	55+	Various – measured VA & subjective visual functioning.
21.	Rudman & Durdle (2008)	34	70+	Low vision – defined as “a degree of sight loss, even with glasses or contacts, which significantly affects daily functioning”.
22.	Rimmer (2006) - Commentary	N/A	N/A	N/A
23.	Rankin (2012)	31	18-63	“blind or partially sighted”
24.	Green & Miyahara (2008)	6	53 - 70	Various (RP, AMD, Cataracts etc.)
25.	Suraka & Kivela (2008)	27	31 – 75 (mean age 54)	Partially sighted, Blind, Deaf-blind (n=4)
26.	De Boer et al. (2004)	1509	65+	Contrast sensitivity, self-reported visual impairment assessed by face

				recognition from distance of 4m, reading small print and problems with glare.
27.	Kovaks et al. (2012)	41	60+	Various: multiple, AMD, DR, Glaucoma, Cataracts.
28.	Campbell et al. (2005)	391	75+	VA of 6/24 or worse
29.	Chen et al. (2012)	40	65+	Low vision or blind
30.	Crews (2003) - commentary	N/A	N/A	N/A

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Figure 1: Search Strategy